University of Alberta

MOTHER-INFANT INTERACTION DURING BREASTFEEDING: A COMPARISON BETWEEN PROBLEMATIC AND NONPROBLEMATIC BREASTFEEDERS

by

Roberta Jean Wilma Hewat

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Doctor of Philosophy

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Mother-Infant Interaction During Breastfeeding: A Comparison Between Problematic and Nonproblematic Breastfeeders

Abstract

In this exploratory study, mother-infant interaction within the context of breastfeeding was examined and interactions between dyads whose infants were perceived by their mothers as problematic breastfeeders were compared with dyads whose mothers perceived their infants as nonproblematic breastfeeders. Mother-infant interaction in general, infant temperament, and maternal postpartum depression were also investigated at two months postpartum.

Participants were 24 first time mothers their fullterm infants. Twelve mother-infant dyads whose infants were perceived as frequently detaching from the breast were matched with 12 mother-infant dyads whose infants breastfed. The matched variables were, maternal age, education, family income, infant's gestational age, birthweight, gender, and age when videotaped. Three breastfeeding sessions were videotaped in the home, twice on entry to the study and when the infants were two months of age.

Ethology, an observational research method was used in phase one of the study. The first two videotaped breastfeeding sessions for each dyad were repeatedly reviewed using slow motion and frame by frame techniques. From this analysis rich descriptions of the mother and infant behaviors were formulated and developed into an ethogram. Differences in tempo and rhythm of the mother-infant interaction patterns were delineated as harmonic attunement, disharmonic attunement, and disattunement. From the ethogram, an observational coding guide identifying specific mother and infant behaviors was developed and hypotheses were generated for testing.

In phase two of the study the videotapes were reexamined by two research assistants who were blind to the two groups to code the mother and infant behaviors. Inter- and intra-observer agreements between the coders were exceptionally high. Findings revealed significant differences between the two breastfeeding groups for the following: the problematic group spent a smaller proportion of their breastfeeding session in harmonic attunement (.19 verses .73); a greater proportion of time in disharmonic attunement (.49 verses .07); and a greater proportion of time in disattunement (.33 verses .21); and a greater proportion of time detached from the breast (.22 verses .06). Mothers in the problematic group touched their infants more firmly and for less time during breastfeeding (.31 verses .69) and the problematic infants touched their mothers more forcefully for a greater proportion of time during breastfeeding (.22 verses .04) than did the nonproblematic infants. The enface position was assumed 2.5 % of the time across all breastfeeding sessions.

At two months postpartum findings showed that there were no statistical differences between the two breastfeeding groups for global interactions or infant temperament. However mothers in the problematic group were significantly more depressed ($p = .0009$) than were those in the nonproblematic group.

The most salient conclusions are: that mother-infant interactions during breastfeeding vary in tempo and rhythmic quality; the interactive patterns identified in this study are a different dimension of mother-infant interaction than are interactions assessed by the NCAFS; the enface position is difficult for mothers to attain during breastfeeding; and mothers who experience breastfeeding difficulties may be at greater risk for developing postpartum depression.

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Chapter 1: Introduction

Breastfeeding is increasingly recognized as an activity that promotes and protects the health of infants and mothers and fosters a close mother-infant relationship. In recent years, evidence from studies conducted in industrialized countries shows that breastmilk promotes optimum growth and development, and protects infants from a plethora of acute and chronic illnesses. This protection continues into the childhood years.

Breastmilk, which is species specific, has been shown to decrease the incidence and the severity of viral and bacterial conditions, namely, otitis media, (Alho, Koivu, Sorri, & Rantakallio, 1990; Aniansson et al., 1994; Dewey, Heinig, & Nommsen-Rivers, 1995; Duncan et al., 1993; Harsten, Prellner, Heldrup, Kalm, & Kornfalt, 1989; Owen et al., 1993; Paradise, Elster, & Tan, 1994; Saarinen, 1982; Sassen, Brand, & Grote, 1994; Teele, Klein, & Rosner, 1989), respiratory disease (Beaudry, Dufour, & Marcoux, 1995; Duncan et al., 1982; Holberg et al., 1991; McIntosh, De Silva, & Oates, 1993; Frank, Woodward, Douglas, Graham, & Miles, 1990; Wright, Holberg, Martinez, Morgan, & Taussig, 1989), and diarrhea and gastroenteritis (Beaudry et al.; Dewey et al.; Howie, Forsyth, Ogston, Clark, & Florey, 1990; Lucas & Cole, 1990; Ruuska & Vesikari, 1991), and to reduce the risk of the Sudden Infant Death Syndrome (Ford et al., 1993) in the first year of life. Beyond infancy, the effects of breastfeeding are associated with contributing to protection against childhood cancers (Davis, Savitz, & Graubard, 1988), insulin dependent diabetes (Blom, Dahlquist, Sandstrom, & Wall, 1989; Borch-Johnsen et al., 1984; Fort et al., 1986; Gerstein, 1994; Glatthaar et al., 1988; Kostraba et al., 1992; Mayer et al., 1988; Metcalfe & Baum, 1992; Virtanen et al., 1991), allergy (Burr et al., 1993; Saarinen & Kajosaari, 1995; Taylor, Wadsworth, Golding, & Butler, 1983),

Crohn's disease in childhood, (Koletzko, Sherman, Covey, Griffiths, & Smith,1989; Rigas et al., 1993), and leading to fewer learning disabilities and improved cognitive development (Doyle, Rickards, Kelley, Ford, & Callanan, 1992; Fergusson, Beautrais, & Silva, 1982; Lucas, Morley, Cole, Lister, Leeson-Payne, 1992; Morrow-Tlucak, Haude, & Ernhart 1988; Wang & Wu, 1996).

For the mother, breastfeeding during the postpartum period enhances uterine contractions and involution (Chua, Arulkmaran, Lim, Selama, & Ratnam, 1994) and more rapid return to her prepregnant weight (Dewey, Heinig, & Nommsen, 1993). Continued breastfeeding throughout the first six to twelve months following childbirth is associated with offering protection against ovarian (Rosenblatt, Thomas, & WHO, 1993) and premenopausal breast cancers (Newcomb et al., 1994; UK National Group, 1993) and osteoporosis (Cumming & Klineberg, 1993; Melton et al., 1993; Sowers et al., 1993).

Many childbearing women consider breastfeeding as a component of "good mothering." As a result, the number of women initiating breastfeeding has dramatically increased but the incidence of premature cessation remains high (Health and Welfare, 1991). Not being able to meet their breastfeeding goals leaves many mothers feeling guilty and distressed (Hewat & Ellis, 1984; Houston, Howie, & McNeilly, 1983), questioning their own maternal abilities (Harrison, Morse, & Prowse, 1985; Hewat & Ellis, 1984). Breastfeeding success is dependent on both the mother and the infant; when problems in breastfeeding are encountered by one partner, they are reflected in the other, the entire feeding process, and the breastfeeding relationship.

Mother-infant interaction is central to the evolving mother-child relationship and the psychosocial development of the child. Breastfeeding is a highly interactive process, and disruptions during breastfeeding can affect mother-infant interactions and the developing relationship. Investigations of patterns of mother-infant interaction during the first year of life have been found to have positive associations with aspects of the interaction in the child's later development, particularly in the child's cognitive and linguistic abilities (Barnard et al., 1989; Clarke-Stewart, VanderStoep & Killian, 1979; Coates & Lewis, 1984; Murray, Kempton, Woolgar, & Hooper, 1993; Murray, Fiori-Cowley, Hooper, & Cooper, 1996; Olson, Bates, & Bales, 1984; Ruddy & Bornstein, 1982; Yarrow, Rubenstein, & Pedersen, 1975), in her or his secure attachment behaviors (Ainsworth, Blehar, Waters, & Wall, 1978), and in sociability (Beckwith, 1972). Hence, when smooth flowing reciprocal interactions are interrupted, the mother-infant interaction patterns become erratic, and both the relationship, and the child's development are at risk (Barnard, 1978).

Characteristics or conditions of one member of the partnership can also influence the interactive partnership and the breastfeeding. Infant temperament is one characteristic that has been identified as influencing both mother-infant interaction and the breastfeeding relationship. Infants perceived as having *difficult* personalities or who cry excessively have been shown to negatively affect the longevity of breastfeeding (Gulick, 1982; Humenick & Van Steenkiste, 1983; Loughlin, Clapp-Channing, Gehlbach, Pollard, & McCutchen, 1985). In addition, an association has been demonstrated between infants who are viewed as difficult, fussy, or negative in mood and mothers showing less emotional responsivity towards their infant, potentially altering mother-

infant interactions (Campbell, 1979; Medoff-Cooper & Schraeder, 1982).

Maternal depression following an infant's birth is a mood disorder that can impact the developing mother-child relationship (Beck, 1995a, 1996c; Field, 1992; Gross, 1989). The mother's altered state influences the quality of her interaction with her infant, influencing the infant's responsivity (Cohn & Tronick, 1989; Cramer, 1993; Field et al., 1985; Karl, 1991; Murray 1992; Murray, Fiori-Cowley, 1996; Tronik, Als, Adamson, Wine, & Brazelton, 1978). Study findings reveal that when postpartum depression continues for at least six months, infants of depressed mothers have poorer outcomes on the Bayley mental and motor scales at 12 months (Field, 1992) and poorer cognitive performance at 18 months (Murray, Fiori-Cowley, et al.) and at four years of age (Cogill, Caplan, Alexandra, Robson, & Kumar, 1986; Sharp et al.,1995).

An association between maternal depression and early cessation of breastfeeding in that depression precedes early weaning from the breast is reported by Cooper, Murray, and Stein (1993). In addition, Barton (1991) and Tamminen (1988) found that breastfeeding mothers who are depressed report more concerns about breastfeeding and their infant's behaviors than do mothers who are not depressed.

Statement of the Problem

Breastfeeding and mother-infant interactions are exceedingly important aspects of maternal and infant health, as is the evolving relationship of the mother and child. However, breastfeeding proponents rarely consider the interaction of the mother and infant during breastfeeding and those who study mother-infant interactions seldom examine this relationship within the context of breastfeeding. The dyadic interaction of mothers and infants during breastfeeding are only alluded to in the breastfeeding

literature. In a published review and bibliography of breastfeeding literature (Coates, 1990), not one of the 46 chapters is specific to the mother-infant relationship during breastfeeding, and citations addressing this topic are minimal. Studies investigating the breastfeeding relationship of mother and infant are also deficient in numbers. In a few studies, primarily using qualitative approaches, researchers focused on the mother-infant breastfeeding relationship (Hewat & Ellis, 1984; Leff, Gagne, & Jeffris, 1994; Leff, Jefferis, & Gagne, 1994; Maclean, 1990; Wrigley & Hutchinson, 1990).

Similarly in the interaction literature, many investigators examined mother-infant interaction during bottle feeding (Bakeman & Brown, 1977; Barnard & Eyres, 1978; Brody, 1976; Conway, 1989; Field, 1977; Kay & Wells, 1980; Kuzela, Stifter, & Worobey, 1990; Osofsky, 1976; Price, 1983) but few investigated interaction patterns during breastfeeding. Richards and Bernal (1972) identified differences in interactions and maternal and infant behaviors during breastfeeding and bottle-feeding and Paul, Dittrichova, and Papousek (1996) confirmed these findings in a study. For two decades there has been a paucity of studies or information about mother-infant interaction patterns during breastfeeding. This lack of knowledge is discouraging for mother-infant dyads experiencing difficulties such as disruptive behavioral patterns during breastfeeding. Systematic exploration is warranted to learn more about this phenomenon.

As a clinician at a breastfeeding centre, the investigator has frequently observed disruptive behavioral patterns between mothers and infants during breastfeeding. The clinical picture includes the following infant behaviors: a detaching on-off pattern at the breast throughout the feeding, choking, sputtering, coughing, active movement of the

body, arms and legs, and at times obvious distress. These behaviors result in mothers becoming frustrated, becoming worried about their infants' experiences and health, feeling rejected at times by their infant, and viewing breastfeeding as a disappointing experience. For many, discontinuing breastfeeding would not be a resolution because they would "feel like a failure" and would "not be doing what is best" for their infant. Many of these mothers are knowledgeable about the scientific evidence showing that human milk has optimal nutritional and protective benefits for infants as well as health benefits for themselves. They also want to experience the closeness of the breastfeeding bond that they have seen and read about and to show health professionals, family members, and friends that they are providing their infant with the "best." Experiencing disruptive behaviors is devastating for many women and could impact the maternal-child relationship in many ways.

The major focus of this study is a detailed examination of mother-infant interactions occurring within the context of breastfeeding among infants that feed well and those identified as problematic feeders. Knowledge of "what is happening" is needed in this area of research to build a foundation for providing relevant interventions for mothers and infants. Therefore, the study formulated this research question: What are the differences in mother-infant interactions during breastfeeding between mothers and infants when the infant is perceived by its mother as a problematic breastfeeder and between infants and mothers when the infant is perceived as a nonproblematic breastfeeder?

Purpose of the Study

The purpose in this exploratory study was to examine and describe mother-infant interactions during breastfeeding and to compare the interactions when infants were perceived as problematic or nonproblematic breastfeeders. Since infant temperament and maternal depression are identified as factors that influence mother-infant interactions and the breastfeeding relationship, examination of these characteristics was also considered important. The specific objectives were:

1. to identify and compare molar level patterns of mother-infant interactions during breastfeeding of infants who are deemed problematic breastfeeders and of infants who are deemed nonproblematic breastfeeders;
2. to compare global level patterns of mother-infant interactions during breastfeeding of infants who are deemed problematic breastfeeders with those infants who are deemed nonproblematic breastfeeders;
3. to describe and compare mothers' perceptions of their infant's temperament for infants deemed problematic or nonproblematic breastfeeders; and
4. to describe and compare postnatal depression scores between mothers of infants who are deemed problematic or nonproblematic breastfeeders.

Assumptions Underlying the Study

1. Breastfeeding is a complex and dynamic process involving two partners. Establishment and maintenance of the process is dependent on the characteristics of each partner and how they fit together.
2. Mother-infant interaction is a dynamic, complex system in which the behaviors and rhythms of each partner interact and mutually modify those of the other (Backman &

Brown, 1977; Barnard et al., 1989).

3. Breastfeeding interactions observed in the home are more natural than those observed in unnatural or laboratory settings.
4. Infant temperament and maternal postpartum depressive states are characteristics of the infant and mother that will influence mother-infant interaction.

Conceptual Framework

The Child Health Assessment Interaction Model developed by Barnard & Eyres (1978), updated by Sumner & Spietz (1994) and illustrated in Figure 1 was the overall framework selected to guide this study. Its concentric circles represent from most outer and largest to most inner and smallest the environment, the mother, and the infant. In the largest circle this interactive model includes both animate (such as, family support) and inanimate (such as the physical surroundings) elements. For this study, the breastfeeding and infant caretaking support the mother received from her significant other, family, friends, and health professionals were of interest. In the second largest circle the caregiver, the child's interactive partner, most often the mother, includes what the caregiver brings to the interactions. Maternal characteristics of interest were age, education, income, parity, intent to breastfeed, physical attributes for breastfeeding, and postpartum depressive state. In the smallest circle, the child includes whatever the child whatever the child brings to the breastfeeding interaction. Infant characteristics were the infant's physical attributes and abilities for breastfeeding, interactional behaviors, and temperament. The dark area where all circles overlap represents the interaction of the infant, mother, and environment and the potential influence each has on the other as each interacts and mutually modifies the other.

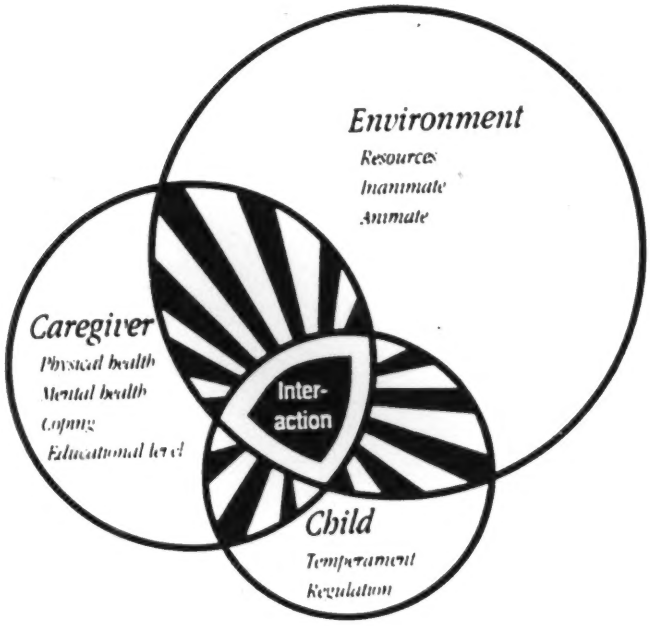

Figure 1. The Child Health Assessment Interaction (CHAI) Model

The main focus of this study is the interactions between the mother and her infant during breastfeeding which is more appropriately portrayed by the Barnard Model (Barnard & Eyres, 1978; Sumner & Spietz, 1994) shown in Figure 2. This model represents the caregiver-infant interaction system. The mother and infant respond and react to the other's responses in a turn taking, back and forth process that is depicted by the arrows. As one partner changes his or her behavior, the other may adjust their behavior to adapt to the other and modify the other's behavior. If the process is disrupted by some interference, shown by the interruption in the lines, the interaction ceases to be smooth flowing and can disintegrate. Characteristics of the mother and

infant influence the interaction process. For a global assessment of mother-infant interaction, the characteristics identified for the parent are sensitivity to cues alleviation of distress, and the ability to provide growth-fostering situations; for the infant, they are the abilities to send the parent clear cues and to be responsive (Barnard & Eyres, 1978). For this study the interaction will be examined using the Nursing Child Assessment Feeding Scale (NCAFS) that was developed to assess these characteristics. However, the interactive process as shown in the Barnard Model will be used to explore behaviors of mothers and infants during breastfeeding.

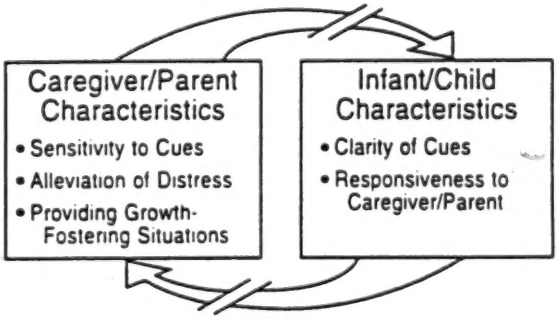

Figure 2. The Barnard Model

Observational research methods are most suited to examining interactive behaviors and since this type of interaction has not been explored in depth, the ethological approach was the study method chosen. This approach starts with an inductive phase in that raw evidence is gathered for interpretation and moves toward a deductive phase in that patterns are determined and compared (Morse & Bottorff, 1990).

Chapter 2: Literature Review

Overview

In this chapter the literature that is pertinent to this study and congruent with the conceptual framework is presented along with the literature that is relevant to both the Child Health Assessment Interaction (CHAI) Model illustrated in Figure 1 and the Barnard Model shown in Figure 2. The major sections include breastfeeding within the context of the identified models, mother-infant interaction, infant temperament, and maternal postpartum depression.

The literature for review was collected in a variety of ways. Two literature searches were conducted using CINAHL, Medline, Pub. Med, and Psychological Abstract databases. The initial search was conducted in 1992 for the timeframe of 1975 to 1992, and the second search was conducted between January and October 1997 for the time period between 1992 and October 1997. Since that time new publications and current journals have been regularly scanned to include the most recent literature on the topics studied. Additional sources of literature were obtained by reviewing reference lists in published articles, in literature systematically collected by the investigator since 1975 on the topic of breastfeeding and since 1980 on the topics of parent-child interaction and infant behavior, and in articles and books suggested by colleagues who were aware of the topics under study.

Breastfeeding within the Context of the Child Health Assessment Interaction Model and the Barnard Model

Breastfeeding is a complex, dynamic, highly interactive process that is dependent on two key partners, the mother and her infant. The characteristics, abilities, and

behaviors these individuals bring to the breastfeeding partnership and how well the attributes of each partner "fit" with the other as well as the support the couple receives from others in their environment can all influence the initiation and continuation of breastfeeding. In this section of the literature review the major maternal, infant, and environmental factors that have been identified as influencing breastfeeding and literature that addresses the mother-infant breastfeeding relationship are described.

Maternal Factors Influencing Breastfeeding

For the past two decades a considerable number of studies in the industrialized countries of Canada, Great Britain, Finland, and the United States have focused on identifying maternal characteristics associated with initiation and longevity of breastfeeding. These studies represent data collected both retrospectively and prospectively. Retrospective studies include national surveys conducted in the United States and Finland in which mothers completed self-report questionnaires six months after giving birth (Martinez & Nalezienski, 1979, 1981; Ryan, Wyson, Martinez, & Simon, 1990; Tamminen, Verronen, Saarikoski, Goransson, & Tuomiranta, 1983). Smaller retrospective studies reviewed report findings from 298 Swedish mothers at six and 13 months postdelivery (Sjolin, Hofvander, & Hillervik, 1977), 239 Scottish women who completed questionnaires six months after their infant was born (West, 1980), 649 Welsh mothers who were interviewed 12 months postpartum (Jones, West & Newcombe, 1986), and 780 Canadian women who completed questionnaires six months postdelivery (Beaudry & Aucoin-Larade, 1989).

Studies in which mothers were followed prospectively following childbirth are more numerous and the sample sizes are smaller and more focused on specific

populations. In Canada, Yeung, Pennel, Leung, and Hall (1979) collected data from 317 women living in Toronto and Montreal, at 11 time points during the 18 months following their infants' births and Goodine and Fried (1984) report findings from 288 middle-class women living in Ottawa who were followed for 12 months postpartum. In Great Britain, Wright and Walker (1983) followed 534 mothers in Leeds for six months, and Cooper et al. (1993) studied 302 primiparous women living in Cambridge and Oxford, England, for eight weeks postpartum. In the United States, three studies were conducted in which women were followed for 12 months postpartum, with sample sizes of 148, 102, and 44. (Duckett, Henly, & Garvis, 1993; Richardson & Champion, 1992; Coriel & Murphy, 1988). A fourth study was conducted by Beske and Garvis (1982) in which 94 primiparous mothers were followed for six months postpartum.

A major concern of breastfeeding research is that most studies do not delineate whether infants receive only breastmilk or if breastmilk substitutes are also included in their diet (Armstrong, 1991; Auerbach, Renfrew, & Minchin, 1991; Labbok & Coffin, 1997; Labbock & Krasovec 1990). For example, breastfeeding should be defined as exclusive, partial, or minimal breastfeeding, depending on the combinations of breastmilk and breastmilk substitutes that an infant is fed. This differentiation of the types of breastfeeding patterns is critical to the analysis and interpretation of studies that report the incidence or duration of breastfeeding and those that examine the relationship between breastfeeding and health outcomes. Although types of breastfeeding patterns (e.g., exclusive, partial, or minimal) have been defined by the Interagency Group for Action on Breastfeeding (IGAB) and internationally accepted since 1988 (Armstrong, 1991; Labbok & Krasovec 1990), investigators have been reticent in using the

recommended definitions.

The lack of defining the meaning of breastfeeding is evident in the reviewed studies that identify factors influencing longevity of breastfeeding. Only three of the studies provided specific definitions of breastfeeding. Goodine and Fried (1984) defined types of infant feeding as *pure* breastfeeding, *combination* breastfeeding or *bottle*; Beaudry and Aucoin-Larade (1989) differentiated between breastfeeding patterns as *exclusive* and *total*; and Jones et al. (1986) indicated that a breastfeeder was "anyone who breast-fed her baby at least once" (p. 142). The breastfeedng definition in the Jones et al. study is an example of a broad definition that may have been used in other breastfeeding studies and indicates that for many studies, findings must be interpreted with caution. The specific maternal characteristics identified as influencing breastfeeding in this literature were reported frequently, consistently, and over time. These factors are grouped as maternal biographic and psycho-physiologic characteristics. All factors are key in the initiation and continuation of breastfeeding. The influence of each factor is discussed.

Maternal biographic characteristics. Maternal biographic characteristics that positively influence initiation and longer duration of breastfeeding are education, age, socioeconomic status, and parity.

Maternal education. The most salient demographic variable related to positive breastfeeding practices is the years of maternal education. In studies that examined women's choice of infant feeding methods prior to birth, breastfeeding is consistently the preferred method of infant feeding by women who have been educated longer (Beaudry & Aucoin-Larade, 1989; Dusdieker, Booth, Seals, & Ekwo, 1985; Gabriel, Gabriel, &

Lawrence, 1986; Matich & Sims, 1992; Sjolin et al., 1977). Similarly, in studies examining breastfeeding initiation rates and longevity, women not completing highschool are less likely to breastfeed, and, when they do initiate breastfeeding, they discontinue much earlier than do women with some college or university education. (Cooper et al., 1993; Goodine & Fried, 1984; Hawkins, Nichols, & Tanner, 1987; Martinez & Nalezienski, 1979; Richardson & Champion, 1992; Ryan et al. 1990; Wright & Walker, 1983; Yeung, 1979). However, this relationship between increased education and the duration of breastfeeding may be relevant only to the industrialized world. Contrary findings are reported by Kocturk and Zetterstom (1989), who found in the developing countries of India, Ethiopia, Nigeria, Guatemala, and the Philippines that breastfeeding rates at six and 12 months postdelivery were lower among well educated, urban, upper class women than they were among those with less education.

Maternal age. Initiation of breastfeeding is more prevalent among women who are over 24 (Gabriel, Gabriel, & Lawrence, 1986) than among those who are 20 years or younger (Dusdieker et al., 1985). Similarly, study findings indicate women 25 years and over breastfeed longer than do those younger than 24 years (Beske & Garvis,1982; Ryan et al., 1990; Wright & Walker, 1983). Other studies show a positive linear relationship between age and breastfeeding longevity (Coreil & Murphy, 1988; Richardson & Champion, 1992), the older the mother, the more likely she is to breastfeed. However, the relationship between older age and breastfeeding longevity is not entirely definitive. Cooper et al. (1993) found that age was associated positively with breastfeeding longevity for women living in Oxford but not for those living in Cambridge, England, and study findings showing no relationship between age and breastfeeding are reported

by Goodine and Fried (1984), West (1980), and Yeung et al. (1979). In addition, Ryan et al. found those women 35 years and older breastfed for shorter periods than did those between 25 and 35 years. With the recent increase in numbers of births to women 35 years and older, more extensive examination of this cohort is warranted, but it is beyond the scope of this study.

Socioeconomic status. Although study findings show that women in industrialized countries who are of a higher socioeconomic position initiate breastfeedng more frequently and breastfeed longer (Beaudry & Aucoin-Larade, 1989; Bloom, Goldbloom, Robinson, & Stevens, 1982; Cooper et al., 1993; Greene-Finestone, Feldman, Heick, & Luke, 1989; Grossman, Fitzsimmons, Larsen-Alexander, & Hartner, 1990; Houston, Howie, Smart, McArdle, & McNeilly, 1983; Jones et al., 1986; Rousseau, Lescop, Fontaine, Lambert, & Roy, 1982; Ryan & Martinez, 1989; Sjolin et al., 1977; Wright & Walker, 1983), this relationship is complex. Socioeconomic status has been shown to covary with education and age; higher education levels and increased age, two variables positively influencing breastfeeding initiation and longevity, are associated with higher income levels. As well, socioeconomic status is related to the breastfeeding support the mother receives from her significant other and evidence in many studies indicates that significant others in the lower socioeconomic levels are less supportive than those of higher income status (Beske & Garvis, 1982; Bevan, Mosley, Lobach, & Salimo, 1984; Bloom et al., 1982; Coreil & Murphy, 1988; Dix, 1991; Matich & Sims, 1992; Raja & Oakley, 1990; Wright & Walker, 1983). However, outcomes from two studies reveal that lower income women who receive support from their significant other comparable to that of higher income women continue to breastfeed for

as long a period (Barron, Lane, Hannan, Struempler, & Williams, 1988; Grossman et al., 1990). Two studies reported no relationship between socioeconomic status and breastfeeding longevity (Beske and Garvis, 1982; Kiel, Anderson, Wilson, Fosson, 1996). Thus, although many studies in the past have linked lower socioeconomic status with lower breastfeeding incidence, the relationship of these variables is complex, unclear, and questionable.

Parity. Parity has been shown to have a variable influence on breastfeeding. Findings from a national survey in the United States (Ford & Labbok, 1990; Martinez & Nalezienski 1981) and a study in Halifax, Canada (Bloom, Goldbloom & Stevens, 1982) show that more primiparous than multiparous women initiate breastfeeding but those multiparous women who breastfeed do so for a longer period of time (Bloom, Goldbloom, Robinson, et al., 1982; Ford & Labbok, 1990; Martinez & Nalezienski 1981). In other studies, specific to regions in Canada (Goodine & Fried, 1984; Yeung et al., 1979), England (Cooper et al., 1993), and the United States (Coriel & Murphy, 1988) and whose subjects were middle class, no associations were found between parity and association breastfeeding. West (1980) reports that in her study the multiparous women who breastfed, were those who had a previous positive breastfeeding experience. This finding could explain some of the differences between primiparous and multiparous women in regard to initiation and longevity of breastfeeding.

Maternal psycho-physiologic characteristics. A mother's perception of her milk supply, her beliefs about breastfeeding, and her internal resources are characteristics that influence the breastfeeding relationship.

Maternal supply of breastmilk. Congruency between the mother's milk production and the infant's needs are important for breastfeeding to succeed. Insufficient milk supply is cited as the most common maternal reason for early cessation of breastfeeding (Bevan et al., 1984; Bloom, Goldbloom & Stevens, 1982; Goodine & Fried, 1984; Hawkins et al., 1987; Hill & Aldag, 1991; Hill & Humenick, 1989; West, 1980; Whichelow, 1982; Yeung et al., 1981). However, the validity of this frequently reported concern is unsubstantiated. Hillervik-Lindquist, Hofvander, and Sjolin (1991) contend this is a perceived rather than a legitimate problem and Tulley and Dewey (1985) suggest that many women only *fear* they will have an inadequate supply. Although decreased milk production is associated with insufficient suckling stimulation, either because of infrequency or inefficiency of the infant suckling (Dewey & Lonnerdal, 1986; Hartmann, 1987; Shrago & Bocar, 1990), it is believed that insufficient glandular tissue is rarely the cause of lowered milk production (Neifert, Seacat, & Jobe, 1985). Estimates of numbers of women unable to breastfeed because of physical or medical problems are reported as ranging from two percent (Brimblecome & Cullen, 1977) to four percent (Brown, Lieberman, Winson, & Pleshette, 1960; Sjolin et al., 1977).

Many mothers perceive that they have an insufficient milk supply based on their assessment that their infant is not satiated because the infant wants to feed frequently. In a Swedish study conducted by Hillervik-Lindquist (1992), 28 mothers who reported lactation crisis defined as "the mother's perception of a lack of breast-milk and doubts about her ability to meet the infant's nutritional needs" (p. 415) were compared with 23 mothers who experienced no episodes of lactation crisis. Between the two groups, no differences were found in the frequency of infant feedings during the day or at night and

the time infants' fed at the breast. These findings support the notion that mothers' reports of insufficient milk supply are influenced by their perceptions that their infants feed frequently because they are not satisfied when in reality their infant's feeding pattern may be "normal" for their developmental stage.

Significant differences in statements about breastfeeding between women who reported lactation crisis and those who did not were evident. Although women in both groups were similar in identifying that breastmilk was the best food for the infant, more women in the lactation crisis group indicated they breastfed because they ought to, and more women in the non-crisis group stated they breastfed for their own emotional satisfaction and practical convenience.

In the United States, Hill and Humenick (1989) identified variables associated with mothers' perceptions of insufficient milk supply, categorizing the variables as potential determinant and indicator factors, then developed a model showing the linkages. The potential determinant and indicator factors were subsequently validated by Hill and Aldag (1991). Potential determinants include maternal confidence, paternal support, maternal health, mother-in-law disapproval, and infant birthweight and potential indicators include baby behavior (fussiness), introduction of solid foods, and use of formula. These factors, associated with the mother's perception of her ability, her health, her support systems, and her infant's behavior are evidence that insufficient milk supply is not due to the physiological inability to produce milk.

Oversupply of milk can also influence longevity of breastfeeding. Clinical observations suggest that for a woman whose milk supply exceeds her infant's needs, the milk is often inadequately or irregularly drained from the breast resulting in a higher

incidence of breast inflammation and infection. It has also been noted clinically that these infants tend to have more frequent occurrences of gas and stools that are a combination of liquid and seed-like particles. Some mothers also have an active or forceful letdown of milk and their infants often experience difficulties breastfeeding because the breastmilk flows too abundantly and quickly. Young infants may choke, cough, and detach from the breast during breastfeeding. Oversupply of milk can lead to maternal dissatisfaction with breastfeeding (Andrusiak & Larose-Kuzenko, 1987). The scarcity of literature on this topic indicates studies on oversupply of breastmilk as well as active letdowns are needed.

Maternal beliefs about breastfeeding. The most important maternal characteristics brought to the breastfeeding partnership are the mother's beliefs about breastfeeding and how breastfeeding meets her infant's needs, her own lifestyle, and her expectations of her maternal role (Hewat & Ellis, 1984; Leff, Gagne, et al., 1994). Beliefs are defined by Sigel (1985) as "knowledge in the sense that the individual knows that what he (or she) espouses is true or probably true, and evidence may or may not be deemed necessary; or if evidence is used, it forms a basis for the belief but is not the belief itself" (p. 348). Formulated over time and within a social or cultural context, then, beliefs are influenced by knowledge, experiences, and personal observations. Beliefs are the "codeterminants of action" (p. 349) and the antecedents of attitudes, which are defined as "a way of thinking, acting, or feeling" (World Book Dictionary, p. 136).

Numerous study findings show that positive maternal beliefs about breastfeeding are associated with longer breastfeeding duration (Duckett et al., 1993; Hewat & Ellis, 1984; Jones et al., 1986; Newton & Newton, 1967; Wright & Walker, 1983). These

studies suggest that mothers who breastfeed longer more frequently report positive statements such as "breast is best," "breastmilk provides better nutrition for baby," "breastfeeding protects infants from illnesses or infections," and "breastfeeding engenders close feelings." These findings are supported in breastfeeding studies conducted for the purpose of model building (Dusdieker et al, 1985) and tool development (Janke, 1994; Leff, Jefferis, et al., 1994). The use of factor analysis in these studies differentiated between positive and negative statements: Statements with high factor loadings that indicate a positive belief about breastfeeding include the following: breastfeeding helps to bond with baby; is better than other types of infant feeding; provides some immunity against infections; is soothing to baby; is a special time with baby; and makes baby feel secure. Statements affiliated with a more negative belief include these: breastfeeding ties you down; is difficult in public; makes your breasts sag; is a burden because it is baby's source of food; and is worrisome because you do not know exactly how much milk a baby has taken.

Positive maternal breastfeeding beliefs, in association with more years of education, was identified by Dusdieker et al.1985, as a key variable for its affect on a woman's decision to breastfeed. Women who decide to breastfeed prior to conception or early in pregnancy are more likely to initiate and sustain breastfeeding in the early postpartum period (Buxton et al., 1991; Dusdieker et al., 1985; Entwisle, Doering, & Reilly, 1982) and to continue breastfeeding longer (Coreil & Murphy, 1988; Goodine & Fried, 1984; Jones et al., 1986).

Maternal internal resources and feelings about the self. How a mother perceives herself as a mother and her confidence in her abilities to care for and breastfeed

her infant have been identified as contributing to successful breastfeeding initiation and longer duration (Laufer, 1990; Loughlin et al., 1985; Virden, 1988). Feelings of confidence are linked to increased self-esteem, and three studies show that women with a higher level of self-esteem are more likely to initiate breastfeeding and to breastfeed longer (Dusdieker et al., 1985; Laufer, 1990, McNatt & Freston, 1992). Findings from a qualitative study of low income women, conducted by Locklin and Naber (1993), suggest that a mother's confidence in her ability to breastfeed is linked to her motivation to continue breastfeeding. Feelings of confidence also increase the mother's self-esteem and generate feelings of empowerment. This is a notable finding among women who often felt disempowered because of their socio-economic status (Locklin, 1995).

When breastfeeding is progressing well, feelings of personal satisfaction and enjoyment also contribute to maternal feelings of self-fulfilment and inner contentment (Dusdieker et al., 1985; Janke, 1994; Leff, Jefferis, et al., 1994). These pleasant feelings and positive experiences further advance the continuation of breastfeeding.

Internal resources that sustain some mothers when breastfeeding difficulties arise are reported in a qualitative study by Bottorff (1990) as persistence and commitment. Mothers' statements suggest that their own feelings of persistence helped them to continue to breastfeed during times of uncertainty or when breastfeeding difficulties were encountered. Women also revealed that being committed to breastfeeding was more than persistence because it meant ongoing involvement that they viewed as a personal choice.

Commitment to breastfeeding among women who breastfeed for longer duration has been identified as important in several additional studies (Arafat, Allen, & Fox, 1981;

Coreil & Murphy, 1988; Rousseau et al., 1982; Ryan & Martinez, 1989; Wright & Walker, 1983). Thus a mother's internal resources, specifically persistence and commitment, assist her to continue breastfeeding during times of adversity.

In summary, important maternal factors that influence the breastfeeding partnership have been identified as biographic and psycho-physiologic factors. Evidence shows that mothers with higher education who are over 25 years of age, who choose to breastfeed prior to or early in their pregnancy, who have positive beliefs about breastfeeding, who are confident in their ability to breastfeed, who enjoy the experience, and who are persistent and committed to breastfeeding are optimum breastfeeding partners who are likely to breastfeed longer. As the mother is only one in a partnership of two, infants also have attributes and behaviors that can influence the breastfeeding relationship.

Infant Factors Influencing Breastfeeding

Infant factors related to breastfeeding that are important to the success of the breastfeeding partnership are the inherent abilities of the infant to breastfeed and behaviors and characteristics that are associated with infant feeding. The literature reviewed is specific to these abilities and characteristics for full term infants.

Abilities of infants to breastfeed. The ability of the infant to latch onto the breast and to suck, swallow, and breathe efficiently is critical to successful breastfeeding (Glass & Wolf, 1994). Effective removal of milk from the breast is necessary to establish and maintain milk production and to satiate the infant. Literature distinctive to infant attachment to the breast is based on clinical observations and anecdotal accounts rather than research findings (Schrago & Bocar, 1990; Marmet, 1984; Matthews, 1988;

Mulford, 1992; Walker, 1989). Similarly, how full term infants swallow is described but in depth studies of this process are limited. Weber, Woolridge, and Baum (1986) used ultrasonography to observe the suck-swallow mechanism of six breastfed and six bottlefed infants between two and six days following birth. Findings showed that during this time period breastfed infants increase their co-ordination and rate of swallow. The researchers attribute these changes to the increase in milk flow that occurs during this time period. Infants' sucking mechanisms and patterns have been the greatest focus of studies on the functional perspective of infant feeding.

Observations of infants' sucking mechanisms during breastfeeding and bottle feeding, using cineradiography, were compared by Ardran, Kemp, and Lind (1958a, 1985b). They noted that for breastfeeding infants the stripping movement of the tongue is more important than a sucking action in removing milk from the breast whereas for bottle feeding infants a piston like motion of the jaw facilitates the removal of milk. Because of the concern of effect of radiation on the infants, studies of this nature were not continued.

Rates, rhythms, and types of infant suck during bottle feeding of four day old full term infants were identified by Wolff (1968) and his observations became the standard of infant suck patterns for breast and bottle feeding infants for many years. Wolff described and compared two types of sucking: nutritive sucking is a slower, continuous suck that occurs in the presence of fluid, and non-nutritive sucking is a more rapid series of sucking bursts and rest periods when no liquid is present. The importance of non-nutritive sucking has also been demonstrated in studies with premature infants (Anderson, 1986; Anderson, Burroughs, & Measel, 1983; Gill, Behnke, Conlon, &

Anderson 1992) but this does not have direct reference to this study.

In 1979, Drewett and Woolridge (1979) reported their observations of five to eight day old breastfeeding infants' sucking patterns. Their findings show the rates of sucking are lower than those identified by Wolff and substantially less variance exists between nutritive and non-nutritive sucking rates (Drewett & Woolridge) when infants breastfeed. Examination of the sucking and resting times throughout breastfeeding sessions also showed that rest periods gradually increase in number of times and duration as the feeding progresses but decrease slightly towards the end of the feeding.

A study positively associating the infant sucking abilities of four to six day old breastfeeding infants with longevity of breastfeeding was conducted by Righard and Alade (1992). The type of infant sucking response was determined by the investigator who inserted her finger into the infants' mouths to assess correct and incorrect sucking action. Although the reliability of this type of examination is questionable, findings revealed that significantly greater numbers of infants who were identified as sucking correctly in the first postpartum week were continuing to breastfeed at one, two, three, and four months postpartum.

Examination of videotaped observations of breastfeeding infants' sucking patterns at 25 to 121 days of age were undertaken by Bowen-Jones, Thompson, and Drewett (1982). Their findings show no dichotomy of nutritive or non-nutritive type sucking, infants at the breast suck in bursts with rests between the bursts, and this pattern is continuous throughout the breastfeeding session. These investigators also substantiated that the rate of infant suck is inversely related to the rate of milk flow; that is, as the milk flow increases the sucking rate decreases. Hence infant's individual sucking rates are

partly dependent on maternal responses that can in themselves vary.

Variability in length of breastfeeding sessions between mother-infant dyads is also influenced by the rate of milk transfer from mother to infant (Howie et al., 1981; Woolridge, Baum, & Drewitt,1982; Woolridge, How, Drewett, Rolfe & Baum, 1982). Thus lengths of breastfeeding sessions are directly dependent on the needs of the infant, and as a result they will vary greatly. Considering the findings of these studies, investigators agree that the length of a breastfeeding session should be determined by the infant. Hence, decisions of this nature are influenced by the infant's behavioral cues.

Infant behavioral cues and characteristics. The infant's behaviors as they relate to feeding are significant to the breastfeeding partnership. Barnard and Eyres (1978) identify the clarity of the infant's behavioral cues, and the response the infant shows to the mother's activities is exceptionally important to the relationship. This is further substantiated in study findings reported by Pridham, Knight, and Stephenson (1989). These investigators identified that for both breastfeeding and bottlefeeding mothers, their identification of their infants' behaviors that show readiness to feed and satiation were of greater importance than the following: infants' self-regulatory behaviors such as rooting or burping; efficient feeding behaviors described as steady sucking while feeding; and establishment of regular feeding times.

Behavioral cues associated with readiness to feed and satiation were identified by Givens (1978) from observations of both breastfeeding and bottle feeding infants. Cues that infants provide to their mothers to signal readiness to feed are rooting, head turning, sucking, mouthing, hand-to-mouth, and crying to eat. Cues indicating satiation are sleep, decreased muscle tone, arms extended along side, and change in activity level or

mood.

Assessment tools to systematically assess newborn breastfeeding behaviors have been developed by several authors although reliability and validity of these tools have not been documented. The instrument developed by Matthews (1988) includes the infant's readiness to eat, rooting and latching abilities, and sucking pattern, defined as the observer's perception of "baby did not suck," "sucked poorly," "sucked fairly well," or "sucked well at both breasts," (p. 158). The Systematic Assessment of the Infant at Breast (SAIB), a tool generated by Shrago and Bocar (1990), focuses on infant position or alignment, areolar grasp, areolar compression, and audible swallowing (p.211). One assessment measure developed by Mulford (1992) incorporates both mother and infant behaviors in a five step breastfeeding process. Observations of infant and mother behaviors that represent signalling, positioning, fixing, milk transfer, and ending the feeding are included in this assessment tool (p.80).

Infant behaviors that negatively influence breastfeeding have been reported in several studies. Loughlin et al. (1985) report that infants who have a demanding personality or who are difficult to breastfeed have an impact on the duration of breastfeeding, and excessive crying is shown as detrimental to breastfeeding (Gulick, 1982; Humenick & Van Steenkiste, 1983; Loughlin et al.). How the mother interprets her infant's crying is of consequence. Hewat and Ellis (1986) found that mothers who perceived their infants cried because they were hungry rather than wanting attention, breastfed for shorter periods. Barr, Kramer, Pless, Boisjoly, and Leduc (1989) report that breastfed infants cry and fuss more frequently than formula fed infants. Findings in this study also reveal that changing an infant from breastfeeding to formula feeding

makes a difference in the crying pattern but not in the amount of crying. Infants who changed from breastmilk to formula feedings cried less in the evening but more in the morning and the amount of time the infant cried in a 24 hour period remained unchanged.

Studies that focus on inabilities or difficulties of some infants to breastfeed are limited. The capabilities of premature infants to breastfeed have received greatest attention from Meier (Meier,1988; Meier & Anderson, 1987; Meier & Pugh, 1985). Articles describing assistance for breastfeeding mothers whose infants have compromised feeding abilities focus on medical conditions such as cleft palate (Grady, 1977; Weatherlye-White, Kuehn, Mirrett, Gilman, & Weatherlye-White, 1987) neurological impairments such as Down's syndrome (Aumonier & Cunningham, 1983) or myelomeningocele (McBride & Danner, 1987).

In summary, infant factors, specific to full term infants that affect the breastfeeding partnership have not been examined as explicitly as maternal factors. Those identified are infants' sucking mechanisms and patterns, behavior cues signalling readiness to eat and satiation, and behaviors detrimental to breastfeeding such as fussing and crying. A few studies are specific to medical conditions such as Down's syndrome or cleft palate that compromise the infant's ability to breastfeed. The effect of infant behaviors on the interactive breastfeeding partnership will be examined in this study.

Environmental Factors Influencing the Breastfeeding Partnership

Support is the factor external to the mother-infant partnership that has greatest influence on breastfeeding (Beske & Garvis, 1982; Isabella & Isabella, 1994). Types of support have been identified as emotional, instrumental, and informational and sources of

support are reported as family, friends, and health professionals.

Family and friends. The mother's significant other is consistently cited as the key provider of breastfeeding support (Albers, 1981; Baranowski et al., 1983; Beske & Garvis, 1982; Bloom et al., 1982; Dusdieker et al., 1985; Hewat & Ellis, 1986; Houston et al., 1983; Jones et al., 1986; Matich & Sims, 1992). Yet, Baronowski et al. found that the phenomenon of a supportive significant other is specific to Anglo-American families. Among Black-Americans a close friend is the most likely support and, among Mexican-Americans, the mother's mother is viewed as most supportive.

Emotional and instrumental support are identified in the literature as the most common types of support provided by (Beske & Garvis, 1982; Bloom, Goldbloom & Stevens, et al., 1982; Buckner & Matsubara, 1993; Hewat & Ellis, 1984; Isabella & Isabella, 1994). Most important to mothers is emotional support, designated as encouragement and praise (Buckner & Matsubara; Hewat & Ellis) and psychological support defined as sensitivity to and understanding of the mother's feelings (Hewat & Ellis) that the significant other can provide. In a comparison of women who breastfed for short or long durations, those who breastfed longer consistently reported that their significant others provided more emotional and psychological than instrumental support.

Next to the significant other, female friends and family are the most influential to the breastfeeding partnership but support is variably encouraging and discouraging. Morse and Harrison (1987) report, that following birth mothers state that "everyone is supportive of breastfeeding" but eventually all notice a pattern of negative behaviors among friends and family that they describe as "silence." Approximately two months later, those who had been silent begin to verbalize negative statements about

breastfeeding to the mothers. This behavior was first initiated by friends at six to eight months, then by grandmothers at 10 months, and finally significant others at a year.

Health professionals. Health professionals are viewed by mothers as the next source of support (Albers, 1981; Beske & Garvis, 1982). Lactation consultants are reported as the most supportive of all professionals. As well as providing more pertinent assistance and information, mothers also report they are most encouraging (Buckner & Matsubara, 1993). Nurses are viewed by mothers as supplying more informational support and physicians as providing informational and advisorial support (Buckner & Matsubara; Isabella & Isabella, 1994; Ryan & Martinez, 1989;Wiles, 1984). This is congruent with nurses' perceptions of their role, but physicians report they provide more emotional than informational support (Lawrence, 1982).

Evidence from studies shows that nurses contribute effectively to promoting breastfeeding and to breastfeeding education (Hall, 1978; Houston et al., 1983; Jones & West, 1986; Kistin, Benton, Rao, & Sullivan, 1990; McNatt & Freston, 1992; Rajan, 1993; Wiles, 1984). However, nurses are also cited as providing conflicting advice, incorrect information, and demonstrating behaviors non-supportive of breastfeeding (Anderson & Geden, 1991; Crowder, 1981; Ellis & Hewat, 1983; Hayes, 1981; Hewat & Ellis, 1984; Iker & Mogan, 1992; Winnikoff, Laukaran, Myers, & Stone, 1986).

In recent years, breastfeeding peer support programs, particularly among low income or at risk populations, have been reported as positively influencing breastfeeding (Kistin et al., 1994; Locklin, 1993; Long, Funk-Archuleta, Geiger, Mozar, & Heins, 1995). The support offered by other women is reported by breastfeeding mothers as particularly beneficial (Locklin & Naber, 1993).

In summary, support is the most positive influencing factor in the environment of the breastfeeding mother and her infant. For most mothers, her significant other is her greatest source of support, particularly in providing emotional support and to a lesser degree, instrumental support. This is followed by family and friends who may encourage breastfeeding at the time of birth but discourage breastfeeding in the latter part of the first year. Lastly, health professionals are reported as a source of informational support, but assistance from health professionals is reported as both beneficial and detrimental to breastfeeding. Recently, peer support programs have been shown to promote breastfeeding particularly among low income or at risk mothers.

The Mother-Infant Breastfeeding Relationship

Studies that focus on the relationship of the breastfeeding mother and her infant are extremely limited. In a study exploring mothers' perceptions of the breastfeeding experience, Hewat and Ellis (1984) conceptualized the breastfeeding relationship as a reciprocal partnership built on ongoing negotiation and integration of the needs of each partner. Subsequently, Wrigley and Hutchinson (1990) interviewed mothers who breastfed longer than a year. They distinguished two key processes of the mother-infant breastfeeding relationship as "synchronization," defined as the mother proceeding in step with her infant and "reorientation" described as the mother rearranging her life to meet the needs of her infant. For women breastfeeding for more than one year, a "secret bond" develops between mother and child, to limit intrusion and protect the breastfeeding relationship from a society that disapproves of long term breastfeeding (pp. 39-40).

Women's perceptions of the rewards and difficulties that they experienced during breastfeeding are reported in a study by Maclean (1990) who also indicates that the women she interviewed had difficulty explaining what is meant by "successful breastfeeding." Leff, Gagne, et al. (1994) undertook further exploration of this phenomenon in a qualitative study. These investigators identify maternal and infant factors that contribute to successful breastfeeding that they describe as "working in harmony" or creating a balance between positive and negative maternal and infant factors specific to breastfeeding. Unsuccessful breastfeeding is viewed as an imbalance in the relationship.

From the findings in this qualitative study, Leff, Jeffris, et al. (1994) developed and tested a maternal breastfeeding evaluation scale. The revised scale is composed of three subscales specific to maternal enjoyment and role attainment, infant satisfaction and growth, and lifestyle, and maternal body image. Further testing of the Maternal Breastfeeding Evaluation Scale (MBFES) was undertaken by Riordan, Woodley, and Heaton (1994) to provide estimates of the reliability and validity. Cronbach alpha coefficients for the three subscales ranged between .83 to .91 indicating internal consistency. Validity was based on determining the relationship between breastfeeding satisfaction and a mother's perception of whether she had breastfed as long as she had intended. The MBFES scores were significantly correlated with the length of time mothers intended to breastfeed ($r = .30$, $p < .01$) and the length of time they breastfed ($r = .39$, $p < .01$), supporting validity of the scale.

In summary, the breastfeeding relationship of each mother-infant dyad is a complex, reciprocal, interactive system influenced by their environment and the

characteristics, abilities, and behaviors of each of the partners, how well they "fit" together, and how well they adapt to each other to maintain a balance that allows them to "work in harmony."

Mother-Infant Interaction

Mother-infant interaction is a communicative dialogue of interactive behaviors between the two partners (Bakeman & Brown, 1977) that is critical to the infant's social and cognitive development (Barnard et al., 1989), mother-infant attachment (Ainsworth et al., 1978; Isabella, 1993), and the developing mother-infant relationship. Although attachment is recognized as an important aspect of the mother-infant relationship the focus of this study is on the interaction of mothers and infants hence the attachment literature is not included in this review. This section, on mother-infant interaction, includes theoretical orientations, infant feeding, enface positioning, mother and infant touch, and observational research.

Mother-Infant Interaction: Theoretical Orientations

A substantial body of knowledge on mother-infant interaction has accumulated since the 1970's. Using an ethological approach, Brazelton, Koslowski, and Main (1974) examined the interactions of five mothers and their infants from two to 20 weeks following birth. Findings from their study depict interaction as a rhythmic, cyclical attention-withdrawal pattern in which the caregiver and infant reciprocally take turns signalling and responding to each other. During interactions infants are attracted to their mothers' or caregivers' facial expressions, vocalizations, and touch and respond by attending to them and at times, increasing their motor activity. Gradually the infants' attending behaviors diminish and the mother takes the lead from the infant and quickly

withdraws just before the infant turns away. When allowed to withdraw, infants often increase the time of the next attending phase. Withdrawal, particularly during periods of intense interactions, is important because it allows the infant to maintain some control of the interaction and this facilitates development of the infant's sense of self. The mother's sensitivity to the infant's need to attend and withdraw and to her ability to respond contingently to the tempo of the infant's behaviors are equally important in enhancing the interaction.

The portrayal of mother-infant interaction as a dance is described by Barnard (1978) as the following: "when a mother and infant are 'waltzing to the same tune,' there is rhythmic flow back and forth between them that is very much like two people waltzing together" (p. 69). Both individuals are viewed as forming interlocking sequences of behaviors that lead to a smooth flowing rhythmic system as they mutually adapt to each other (Barnard et al., 1989). Four characteristics that must be present for optimal parent-child interaction are delineated by Barnard et al. as the following: both partners must have a sufficient repertoire of behaviors such as the ability to see, hear, signal, and read and respond to each other's cues; both partners must respond contingently to each other; the interaction must be rich in content (that is, the mother must provide relevant stimulation and, through appropriate responses, the infant must be mutually involved in the activities that occur); and the interaction patterns change and adapt as the infant develops. As mothers and infants become familiar with the sequences of their interlocking behaviors, they become attuned to one another. When the interactive dialogue is smooth and free flowing, interactions are pleasant and relaxed (Barnard et al.; Kaye & Fogel, 1980; Kay & Wells, 1980). When this rhythmic pattern is disrupted by

unresponsive behaviors or an inability in one of the partners, the interaction is less smooth and less satisfying, compromising the interaction and the mother-infant relationship.

Synchrony in mother-infant interaction is identified by numerous authors (Beebe & Gerstman, 1980; Booth, Lyons, & Barnard, 1984; Censullo, Bowler, Lester, Brazelton, 1987; Karger, 1979; Thoman, 1975). Although one definition is not consistently used, descriptions reflect co-occurring, coordinated behavior, that are similar in rhythm and tempo in both partners. Condon and Sander (1974) suggest that from birth the movements of infants' arms and legs are synchronized to their mothers' speech. Smooth-flowing synchronous interactions are viewed as contributing positively to the developing mother-infant relationship and the social experience of the infant.

The mutual regulation model of infant-mother social interaction has emerged from several studies (Tronick & Cohn, 1989; Tronick, Cohn, & Shea, 1986; Tronick & Weinberg, 1997; Weinberg & Tronick, 1994). The researchers of this model suggest that the infant's communicative behaviors are represented as expressions of four configurations of behaviors: affective behavior, active protest, object engagement, and passive withdrawal. Through these configurations infants communicate their affective state conveying their intent and evaluation of the interaction to the mother who then regulates her behavior and responses in the interactive process. Examination of the types of interactions exhibited by normal mothers and infants show variability. Study findings indicate that dyads' interactions demonstrate moderate amounts of positive affect, some negative affect, and moderate amounts of synchronization. (Tronick & Weinberg).

Infant Feeding and Mother-Infant Interaction

Feeding is viewed by many researchers as an excellent context for observing interaction behaviors of mothers and infants (Barnard & Eyres, 1978; Brody, 1976; Dunn, 1977; Dunn & Richards, 1977; Field, 1977 ; Gesell & Ilg, 1937; Kaye & Wells, 1980; Osofsky, 1976; Thoman, 1975). The reasons are that feeding is one of the first interactions between the mother and infant after birth; it occurs frequently throughout the infant's first year; and it is a context in which behaviors and quality of interaction patterns between dyads can be captured (Spietz, 1978).

Although the feeding situation has frequently been used for interaction studies (Bakeman & Brown, 1977; Barnard, Bee, & Hammond, 1984; Osofsky, 1976) most investigators do not distinguish between mothers and infants who breastfeed and those who bottlefeed. A study by Richards and Bernal (1972) was one of the first to report differences. These investigators observed and compared mother-infant interactions among 35 second born infants during the first 10 postpartum days of life some of whom were breastfeeding and some of whom were bottle feeding. Results indicated statistically significant differences between the two groups for the following variables: the breastfeeding dyads' feeding sessions were longer (measured by length of time the nipple was in the infant's mouth) and the breastfeeding mothers touched their infants more, talked to their infants more, and talked to them more affectionately. The authors conclude "that breast- and bottle-fed infants may differ at birth (as their mothers do) and have a different interaction with their mothers during the first ten days of their lives" (p. 193). At eight weeks postpartum significant differences in behaviors between these two groups were again revealed. The breastfeeding mothers kissed, touched, and smiled

more at their infants and removed their nipple from the infant's mouth in response to their infants' behaviors. In contrast, bottlefeeding mothers stimulated their infants more during feedings and initiated the removal of the bottle teats from their infants' mouths (Dunn & Richards, 1977).

Several studies have compared maternal stimulation during breast-and bottlefeeding (Alberts, Kalverboer, & Hopkins, 1983; Field,1977; Kay & Wells, 1980). In a study of four month old infants, Field defined maternal stimulation during feeding as smiling, talking, and poking during feeding. Infants were either normal, fullterm breastfeeders or bottlefeeders; postmature, disruptive bottlefeeders; or premature bottlefeeders. Maternal stimulation was not significantly different in the fullterm breastfeeding from bottlefeeding dyads; yet the premature infants received more stimulation from their mothers when the nipple was in their mouths (30 % of the time) and the disruptive, postmature infants received the least stimulation (17 % of the time).

Kay and Wells (1980) explored mothers' behaviors during feedings. They noted that, at two days and two weeks post delivery, mothers jiggled the nipple in their infants' mouths during burst pause sucking phases. These behaviors are identified as initial communication interactions. No significant differences in maternal interactive behaviors between 22 breastfeeding and 30 bottlefeeding dyads were found. Similar behaviors of mothers and infants were also documented in an observational study of seven breastfeeding neonates within two days following their births (Alberts et al., 1983).

The qualities of mother-infant interactions between 40 breastfeeding mothers and their first born infants were compared by Furr and Kirgis (1982). Findings revealed that the 20 mothers who were randomly assigned to a group receiving this intervention that

consisted of a 30 minute teaching session about newborn behaviors on their third postpartum day had statistically significant higher NCAFS scores than did mothers not receiving the intervention. The researchers conclude that mothers receiving this intervention show greater adaptability and sensitivity to their infants' cues.

In a more recent study (Paul et al., 1996), the intakes of milk per minute were distinctly different between breastfeeding and bottlefeeding infants. The breastfed infants consumed 8 ml. per minute whereas the bottlefed infants ingested 28.5 ml. in the same time period. For infants at two weeks of age, it was concluded that the prolonged breastfeeding sessions facilitated more opportunities for intimate social contacts, enhancing mother-infant interactions among the breastfeeding dyads when compared with those bottlefeeding.

Enface Positioning

Eye-to-eye contact between mothers and infants is one of their first interactive exchanges that is considered important for beginning social interactions (Stern, 1974) and human sociability (Rheingold, 1961), developing communication skills (D'ordorico & Levorato, 1990; Field 1977) and facilitating mother-infant interaction (Papousek & Papousek, 1997). The enface position is identified as occurring when the mother and the infant are situated so that their eyes "fully meet in the same vertical plane of rotation" (Robson, 1967, p.14). This position maximizes direct eye-to-eye contact and has been shown in a study of infants seven to 26 weeks of age to be the position that mothers assume when they socially interact with their infants (Watson, 1965).

Findings from studies that examined infant response to the human face indicate that direct eye-to-eye contact, attained when a mother and infant are in the enface

position, is a stimulus for evoking infant social smiles (Spitz & Wolff, 1946; Watson, 1965). These types of smiles initiated by the infant elicit positive maternal feelings and foster attachment in the first three months following birth (Robson, 1967).

Visual interactions between mothers and infants that occur in the first three months are an early venue for reciprocal exchanges. During mutual visual engagements, infants will avert their gaze when stimulation is intense, mothers then elicit the infants' attention back to her, and positive engagement ensues until one of the partners, which is most often the infant, disengages. This sequential pattern of visual exchanges is an early indicator of reciprocal interactions between mother and infant (Brazelton et al., 1974; Stern, 1974).

Using an ethological approach, Givens (1978) examined videotaped infant behaviors during feeding and teaching sessions of 10 mother-infant dyads at one, four, eight, and 12 months of age. The delineated behaviors were the basis of the NCAST feeding and teaching scales developed by Barnard and Eyres (1978). Givens identified that mutual gaze between mother and infant fostered positive interactions, and, although this type of interaction was infrequent at one month of age, these engagements increased in each period examined. Positive associations between use of the en face position and "affectionate touching, gentle handling, soft high pitched voice, cuddling, kissing, and smiling" were also documented. Conversely, when the enface position was not used, parents were less likely to use "emotionally warm signs" when interacting with their infants (p. 261). In recognition of these findings, use of the enface position for 50 % of a feeding session was included in the NCAF scale as a positive maternal interactive behavior.

Mother and Infant Touch During Feeding

Touch is an important component of mother-infant interaction (Brazelton et al., 1974; Kaye & Wells, 1980; Pelaez-Nogueras, Field, Hossain, Pickens, 1996; Stack & Muir, 1990, 1992). However, studies focusing on mother-infant touch during feeding are limited. Stroking and caressing have been identified as the most frequent type of maternal touch during feeding (Dunn, 1977; Millot, Filiartre, & Montagner, 1988). Dunn and Richards (1977) report a significant difference in the amount of stroking and caressing displayed by breastfeeding mothers when compared to bottlefeeding mothers within the first 10 days following birth. Millot et al., did not distinguish between touch and the type of infant feeding, but they found during the first 10 days postdelivery that stroking was the most common type of maternal touch and this occurred more frequently during feeding than when infants were either awake and not feeding or asleep.

Alberts et al. (1983) observed seven breastfeeding neonates during their second to ninth feedings following birth. Study findings revealed that maternal tactile stimulation during breastfeeding consisted of jiggles and strokes that were predominant during the infant's sucking pauses. The effect was similar to findings of Kaye and Wells (1980) in that the jiggling lengthened the infant's pause phase. When jiggling ceased the infants resumed sucking, indicating that infant's have the ability to reciprocally respond to interactive behaviors soon after birth.

Epstein (1993) observed breastfeeding sessions of 13 infants and toddlers ranging between 5 weeks and 2 ½ years of age. Study findings revealed that although tactile stimulation was the most "intricate and elaborate interactional component," all mother-infant couples had different styles of touch during feeding. For some dyads it was static

(holding) and for others it was constant movement similar to massaging. It was also noted that tactile stimulation was reciprocal and that touches could occur during periods of intense or less intense sucking periods. Sequences of reciprocal touching were not described nor were types of aggressive touch such as poking or kicking documented.

Observational Research and Mother-Infant Interaction

Observational research is a method chosen by many investigators for studying mother-infant interaction (Bakeman & Brown, 1977; Bakeman & Gottman, 1987; Barnard, 1978; Blehar, Lieberman, & Ainsworth, 1977; Brazelton et al., 1974; Condon & Sander, 1974; Field, 1977; Price, 1983; Richards & Bernal, 1972; Stern, 1971). This method permits researchers to watch behaviors that are occuring rather than asking individuals what they do and this is more relevant than interviews or questionnaires for studying mother-infant interactions (Booth & Mitchell, 1988; Papousek & Papousek, 1997). In conducting observational research, investigators must decide what to observe, how to systematically collect reliable and valid data, and how to analyze the data collected so that it reflects the questions posed and the study purpose (Lewis & Rosenblum, 1974). Interactions between mothers and infants can be examined on one of two levels: a global level that focuses on how two individuals react and respond to each other or at a micro level that centres on the interlocking, behavioral patterns of a dyad's interaction.

Global interaction assessment. Scales developed for assessing global interactions are the Nursing Child Assessment Teaching Scale (NCATS) which assesses caregiver-child interaction during a teaching session, the Nursing Child Assessment Feeding Scale (NCAFS) which is specific for evaluating caregiver-child interaction during feeding

(Barnard et al., 1989) and the Assessment of Mother-Infant Sensitivity (AMIS) Scale, developed for measuring the quality of mother-infant interactions within a feeding context, in the first three months following the infant's birth. (Price 1983).

The NCATS and the NCAFS, revised in 1976 and reviewed in 1994, are well known instruments with acceptable psychometric properties that have been used by numerous researchers and practitioners to examine interactive patterns. Both scales comprise 73 and 76 binary items, respectively, that represent six subscales, four subscales describing caregiver behaviors and two subscales representing infant behaviors. Caregiver subscales are sensitivity to cues, response to child's distress, social-emotional growth-fostering, and cognitive growth-fostering. Infant subscales address clarity of cues and responsiveness to the caregiver (Barnard et al.,1989). The NCAFS can suitably be used with infants between one and 12 months of age and the NCATS can appropriately be used with infants between one and 36 months of age.

The AMIS Scale (Price,1983) has 25 items, evaluating 15 mother behaviors, seven infant behaviors, and three dyadic behaviors. These items, rated on a 5-point scale, represent behaviors such as maternal holding style, mood, verbalizations, caregiving style, and infant state, mood, distress, and posture, and synchrony and regulation of feeding. In comparing the AMIS Scale with the NCAFS, the number of behaviors observed are reduced from the 76 items on the NCAFS to 25 items on the AMIS Scale. Although the 5-point rating scale for each behavior item on the AMIS Scale permits greater discrimination for 25 items, acceptable levels of interrater reliability for the observed behaviors among the number individuals certified to use the NCAFS would be difficult to achieve.

Micro level interaction assessment. The Dyadic Mini Code (DMC) (Censullo et al., 1987), an instrument for measuring infant-adult synchrony in face-to-face interactions during infancy, is a revision of the dyadic Interaction Code (DIC) (Censullo, Lester, & Hoffman, 1985). The six items represented in the instrument are mutual attention, positive affect, mutual turntaking, maternal pauses, infant clarity of cues, and maternal sensitive responsiveness to the infant. Interaction behaviors are analyzed by using spectral and cross-spectral analyses, which are complex methods for determining the cyclical nature and synchrony of the mother's and infant's behaviors. Although further testing of this instrument is needed, the strength of the instrument is that it has been shown to discriminate levels of synchrony in dyadic couples.

A method for measuring synchrony was developed by examining mother-infant interactions of 10 to 12 month old infants (Booth et al., 1984). Based on a method of calculating synchrony used by Karger (1979), the authors devised a new procedure for determining levels of synchrony in maternal-child interactions. Although data collection and reduction of data were tedious, the method of calculation demonstrated that the frequency-based synchrony measure discriminated levels of synchrony in dyadic interactions.

In conclusion, infant feeding is an excellent context for observing variances in interaction patterns of mothers and infants. Instruments have been developed for systematically observing mother-infant interactions at a global level and methods have been used for examining micro level patterns of interaction. Although Richards and Bernal (1972) showed that there are differences in interactions between breastfed and bottlefed mother-infant dyads and although Field (1977) reported differences in bottlefed

disruptive feeders, further examination and comparisons of mother-infant interactions during different feeding modes has been limited. Observational studies focusing on mother-infant interaction patterns during breastfeeding are needed, particularly for dyads who experience difficulties or dyssynchrony in the feeding process.

Infant Temperament

Infant temperament is an infant characteristic that influences both mother-infant interaction and breastfeeding. The literature reviewed on this topic includes conceptualizations of temperament, the "goodness of fit" (Thomas & Chess, 1977) model, research issues and measurement, and infant feeding and temperament.

Conceptualizations of Temperament

Approaches to individual differences in temperament of infants and children are variable depending on the theoretical propositions of several authors. A perspective used in many studies is the one of Thomas and Chess (1977) developed from findings from the New York Longitudinal Study (NYLS). This is a prospective investigation of 129 subjects and their families from the time the infants were two to three months to 30 years of age. The theory proposes that temperament is the reciprocal effect of the environment on the individual, that is, individuals interact with persons and objects in their surroundings, mutually modifying each other. More recently, aspects of neurobiology have been added to the authors' view. Chess (1990) now describes temperament as "a neurobiologically determined variable that mediates between an internal or external stimulus and the response of the brain that is then expressed in the feelings, thoughts, and behavior of the individual" (p. 322). Defined as a representation of behavioral style, temperament is the *how* of behavior, not the *why* (motivation) or

what (individual abilities) (Chess, 1990; Thomas & Chess, 1977, 1980). This latter and more functional definition of temperament has been the basis of focus for many researchers and clinicians, on the temperament of infants and children. Dimensions of temperament are represented in nine categories that are: activity level, rhythmicity, approach or withdrawal, adaptability, threshold of responsiveness, intensity of reaction, quality of mood, distractibility, and attention span and persistence. These categories are used to classify three temperament types, defined as, "easy," "difficult," or "slow to warm.".

Other approaches to temperament are evident in the literature and have contributed to the evolution of this construct. Buss and Plomin (1975) support behavioral style and environment as dimensions of temperament but emphasize that temperament is inherited and constitutional and is a trait characteristic of an individual's personality. They suggest that throughout a lifetime an individual's behavior may change but the dimensions of their temperament remain relatively stable. More recently, Kagan and Snidman (1991a, 1991b) have linked neuroscience and genetics to their conceptualization of infant temperament. These authors contend that "the young infant's behavioral profile interacts with its social environment to produce, over time, a particular constellation of moods and behavioral propensities" (Kagen & Snidman, 1991b, p. 856).

Discrepancies in measuring the stability of temperament are inevitable and could be due to different methods, instruments, populations, and sample sizes. Or, in support of the view of Thomas and Chess (1980), variance can be expected because of developmental changes, different situations, and environmental modifications that occur over time. The latter is referred to as the "goodness of fit."

The Goodness of Fit Model

The impact of the environment on temperament is further explained by the models of "goodness or poorness of fit" (Chess, 1990; Thomas & Chess, 1980). Goodness of fit is defined as congruency among parents' expectations and the child's individual abilities, capacities, and style that facilitate positive interactions and reinforce behaviors that promote optimal, progressive development (Carey, 1990). Poorness of fit is viewed as conflict or dissonance between environmental elements and the child's characteristics, contributing to "distorted development and maladaptive functioning" (Carey, p. 30).

The notions of goodness or poorness of fit and mutual modification have propensity for mother-infant interactions. The temperament of the infant can influence the attitude and actions of the mother, which can consequently affect mother-infant interactions and the child's development (Bell, 1974; Chess, 1990; Thomas, Chess, & Birch, 1968). This is illustrated in a study by Campbell (1979).

Although the sample size is small (n = 12) for sub-group analysis and findings must be interpreted with caution, Campbell (1979) found significant differences in the interactional behaviors of mothers who rated their three month old infants more positively than did those who rated their infants as difficult. The latter group vocalized less, engaged in mutual vocalizations less, and spent more time away from their infants although no differences in time spent in caretaking activities or in play were noted. At eight months no difference was noted in the ratings of infant temperament in the experimental and control groups. However, mothers of previously identified "difficult" infants continued to respond less to their infants' cries, to vocalize less, and to engage in

fewer reciprocal vocalizations with their infants. Campbell concludes that difficult temperamental characteristics in early infancy may set the stage for the development of less responsive and sensitive mothering in some mother-infant dyads.

These findings were further substantiated in a study by Medoff-Cooper and Schraeder (1982). They found that very low birth weight infants who were fussy and who exhibited a negative mood received less emotional responsivity and involvement from their mother. Thus, an infant with a difficult temperament can "turn-off" the caregiver who then interacts less with the infant. As a result the interactional pattern within the dyad is affected and in the long term the infant's social and cognitive development could be compromised.

Research Methods and Issues

Methods used for studying infant temperament include self-report questionnaires, interviews, and home or laboratory observations (Rothbart & Goldsmith, 1985). Of 26 measures that have been developed for studying temperament between infancy and middle childhood (8 to 11 years), reviewed by Hubert, Wachs, Peters-Martin, and Gandour (1982), two are observational and the remaining are self-report questionnaire or interview formats. For most of the measurement questionnaires reviewed, the psychometric properties are estimated as moderately high in internal consistency, high in interrater reliability, and moderate, inconsistent, or not reported for test-retest reliability (Hubert et al.). To accommodate developmental growth, instruments have been produced for each developmental stage. Self-report questionnaires based on the NYLS (Thomas & Chess, 1977) vary from the Early Infancy Temperament Questionnaire (EITQ), recently developed for use with infants who are one to four months of age

(Medoff-Cooper, Carey, & McDevitt, 1993), an Infancy Temperament Questionnaire to use with infants who are between four and eight months (Medoff-Cooper, Carey & McDevitt, 1990), and questionnaires specific to specific stages, ending with early adulthood (18 to 24 years) (Chess & Thomas, 1990).

A major research issue is the use of self-report questionnaires in which parents report their infants' temperament behaviors. The question is whether parents' reports accurately portray infants' temperaments: the parents' perceptions and interpretations of their infants' behaviors may be biased and/or their knowledge of infant behaviors as a referent maybe limited particularly if they are first-time parents. This is illustrated in a study by Elliott, Drummond, and Barnard (1996) in which primiparous mothers were asked if their one month old infant cried more or less than their expectation of the amount an average infant cried. Findings showed that mothers who identified their infant's as excessive criers and those who did not underestimated their infant's crying in comparison to their estimates of the amount average infants cried. As well, those who had identified their infant as an excessive crier, rated their infant closer to the average infant than those in the non-excessive crying group. Diminishing their estimation of their infant's crying is referred to as downward comparison. The investigators suggest this occurs to increase a mother's self-esteem, explaining that the more similar individuals of low self esteem feel to a comparison group, the better they feel. This phenomenon could be a factor in parents' estimations of their infants' temperaments. . Inconsistencies between professionals' observations of infants' behaviors and parents' self-report measures have also been documented (St. James-Roberts & Wolke, 1988).

However, recognition of the importance of parental perceptions of their children is increasing. Many researchers advocate that parents' assessments of infant temperament are valuable because parents are the best informants of the range of their infants' temperamental patterns that occur in a variety of settings (Carey, 1983; Field, Hallock, Dempsey, & Shuman, 1978; Johnson, 1992; Long, 1992; Rothbart & Goldsmith, 1985; Thomas & Chess, 1977; Wolk, Zeanah, Coll, & Carr, 1992). In an examination of the accuracy of parents' responses of their infants' temperament, Carey (1990) reports significant positive correlations between infant behaviors rated by two independent observers during home visits with questionnaires completed by parents.

Long (1992) contends that parents' reports are more reliable and valid if the parents are assessing a current function, if the questionnaire used has clear and specific instructions, and if characteristics of the parents involved are taken into account. For example, parents of low socioeconomic status tend to provide less reliable data than do those of higher status; in one study, however, the decreased accuracy was a result of omissions on the questionnaire, not necessarily a result of socioeconomic status or the parents' perceptions of their children's temperaments. Other parental characteristics described as influencing the accuracy of parents' ratings of their infant's temperament are education, culture, and mental state (Bates & Bayles, 1984; Long ; Oberklaid, Prior, Sanson, Sewell, & Kyrios, 1990; Sameroff, Seifer, & Elias, 1982). These factors must also be considered when asking parents to complete temperament measures.

Infant Temperament and Breastfeeding

A study by Barr et al. (1989) addressed infant temperament, specifically fussing and crying and the choice of infant feeding during the first six weeks of life. Findings

showed that breastfed infants initially fussed and cried more than did formula fed infants in a 24 hour period but that choice of feeding method and temperament were not predictive of crying behaviors in newborns. An interesting finding was that infants who changed from breast to bottle feedings also changed their pattern of crying, the more excessive fussiness and cry periods changed from evenings to mornings but the length of time the infant cried and fussed was the same in a 24 hour day. Other studies associating breastfeeding longevity and infant behaviors have been conducted (Gulick, 1982; Humenick & Van Steenkiste, 1983; Loughlin et al., 1985), showing that breastfeeding is terminated prematurely among infants who cry excessively and among those who are perceived by hospital nurses as having "difficult" personalities.

In conclusion, infant temperament or *how* an infant behaves is an infant characteristic that influences mother-infant interaction and the breastfeeding partnership. However, infant temperament is a construct that is gradually evolving in regard to its definition and its stability over time. Issues related to measurement of infant temperament for research purposes and accuracy of parental reports of their infants' temperaments are ongoing.

Maternal Postpartum Depression

Postpartum depression is a maternal characteristic that can negatively impact the developing mother-child relationship. The aspects of postpartum depression that are reviewed in this section of the paper are the definitions and prevalence of depression following childbirth, measures used for screening and assessing postpartum depression, maternal depression and mother-infant interaction, infants and postpartum depression, and breastfeeding and depression. Discrepancies in the meanings of the terms used to

identify postpartum depression are evident in the literature. In this paper the term used to refer to postpartum depression is that of the authors in the studies reviewed.

Definitions and Incidence of Postpartum Depression.

Depression following childbirth is characterized by symptoms ranging from a transient depressive mood state to a psychotic depressive illness. Three classifications of depression are recognized as postpartum psychotic depression, postpartum "blues," and non-psychotic depression (Cutrona, 1982; Hopkins, Marcus, & Campbell, 1984; O'Hara 1997). Differences in these types of depressions depend on the time of onset, the duration, and the severity.

The most severe condition, which is rare, is postpartum psychosis. Estimates of the number of women affected is cited as one to two (Herzog & Detre, 1976; Lindstrom, 1984) or one to five (Pitt, 1982) for every 1000 births. Most cases are apparent during the first month postpartum and 42 % are reported to occur within the first postpartum week (Meltzer & Kumar, 1985). Postpartum psychosis is characterized by delusions, hallucinations, and dysfunctional behaviors, and many cases require hospitalization.

Postpartum "blues," described as transient irritability, weepiness, and emotional liability, appears in the first postpartum week, generally peaks on days four to six (Beck, Reynolds, & Rutowski, 1992; O'Hara, 1997), and lasts no longer than two weeks (Cox, 1986). The reported incidence varies between 33 % (Handley, Dunn, Waldron, & Baker, 1980) and 80 % (McIntosh, 1993; Ward, 1989) of all women following childbirth. However, women who experience "severe" postpartum "blues " in the first 10 postpartum days are at greater risk for developing non-psychotic postpartum depression

within three to five months following delivery (Beck, 1996a; Kendell, McGuire, Connor, & Cox, 1981; Paykel, Emms, Fletcher, & Russaby, 1980).

Non-psychotic postpartum depression is also referred to as clinical or situational depression (Karl, 1991), depressive symptomatology (McIntosh, 1993), or simply postpartum depression, the term used throughout this paper except when a different term is used by an author. Recently, diagnoses have been standardized to include dysphoric mood plus several symptoms such as appetite disorder, excessive guilt, suicidal thoughts, psychic anxiety, insomnia, anger, and irritability (Affonso Lovett, Paul, & Sheptak, 1990; American Psychiatric Association, 1994; O'Hara, 1997).

Estimates of prevalence reported in studies vary greatly depending on the criteria used for diagnosis, but generally rates are 10 to 15 % for moderate to severe postpartum depression (Beardslee, Bemporod, Keller, & Klerman, 1983; Carothers & Murray, 1990; Cooper, Campbell, Day, Kennerly & Bond, 1988; Cox, Connor, & Kendell, 1982; Cox, Murray, & Chapman, 1993; Cutrona, 1982; Kumar & Robson, 1984). Rates for mild postpartum depression have been reported as high as high as 20% (Hopkins et al., 1984) and 24.8 % (Gotlib, Whiffen, Mount, Milne, & Cordy, 1989) in two Canadian studies. These rates are higher than those found in the general population (O'Hara, Zekoski, Phillips, & Wright, 1990; Watson, Elliott, Rugg, & Brough, 1984) and for women during pregnancy (Kumar & Robson, 1984; O'Hara, Neunaber, & Zekoski., 1984). Of great concern is that for many women postpartum depression is not recognized, and symptoms continue without treatment from health professionals (Arizmendi, & Affonso, 1984; Karl, 1991). Symptoms such as mood dysphoria, lack of interest in activities, flat affect, sleep disturbances, and disorders associated with eating

can last throughout the first postpartum year, compromising the mother's functional abilities and her interaction with her infant.

An association between childbirth and postpartum depression is evident but the relationship is not clear (O'Hara, 1997). Cooper and Murray (1995) query whether there are two distinct populations of women who experience postpartum depression: those with depression related to the demands of motherhood and those with postpartum depression associated with stressors unrelated to childbirth. Similarly, Affonso (1992) suggests that depression experienced after childbearing may be of a different subtype. She argues that "mood and affective changes that occur during childbirth are maternal responses to the complex psychosocial transitions and psychological changes in gestation" (p. 217), and this warrants further investigation.

In two qualitative studies of women's experiences of postpartum depression, C. T. Beck (1992, 1993) reports that the woman's feelings of loss of control is a major factor contributing to her postpartum depression. Other themes delineated by Beck are loneliness, obsessive thinking, insecurity, anxiety, guilt, diminished concentration, fear that life will never be normal again, loss of interest in hobbies or goals, lack of all positive emotions, and contemplation of suicide. These characteristics, all of which emerged from women's rich descriptions are indicative of this condition and should be useful in screening and identifying women with postpartum depression.

Measures for Screening and Assessing Postpartum Depression

Beck Depression Inventory (BDI). Until the last decade, tools used for identifying postpartum depression were those used for assessing depression among the general population rather than measures specific to postpartum depression. A self-report

scale that was frequently utilized in studies of childbearing women is the BDI (A. T. Beck , Ward, Mendelson, Mock, & Erbaugh, 1961). This 21 item measure is reported to be reliable for general depression (Reynolds & Gould, 1981; Strober, Green, & Carlson, 1981) but insensitive to the symtomotology of postpartum depression (Gotlib et al., 1989; Mayberry & Affonso, 1993) and inappropriate for use with childbearing women (O'Hara et al., 1984). Recently the BDI has been revised and is known as the BDI-II (Beck, Steer, & Brown, 1996). Although the 21 items are the same the majority of the item descriptors are reworded and the purpose of the tool remains as a measure to assess the severity of depression in psychiatrically diagnosed adults and adolescents.

The Edinburgh Postnatal Depression Scale (EPDS). Developed in the late 1980's the EPDS (Cox, 1986; Cox, Holden, & Sagovsky, 1987) is a 10 item self-report scale that is specific to screening and assessing women for postpartum depression in the early weeks and months following childbirth. For each of the 10 items, one of four responses is selected and scored from 0 to 3. Higher scores indicate the extent or severity of the postpartum depression. This measure is internationally recognized and used both in research and clinical assessments throughout Great Britain, North America, Sweden, and the Netherlands (Cox et al.; Lundh & Gyllang, 1993; Pop, Komproe, & van Son, 1992; Reighard & Evans, 1995). Reliability estimates for internal consistency range from .82 to .87 (Cox et al.; Pop et al.) and the scale is sensitive to identifying women with postpartum depression (Cox et al.: Harris, Huckle, Thomas, Johns, & Fung, 1989; Murray & Carothers, 1990) and assessing changes in depression over a period of time (Cox et al.). The validity of this measure is based on its capability of correctly identifying women known to be depressed. Estimates are reported as 67% accurate in a

study conducted in Great Britain by Murray & Carothers and 76 % in a Swedish study conducted by Lundh & Gyllang. Some of the discrepancy in these results could be due to translation of the tool from English to Swedish.

The Postpartum Depression Checklist (PDC). Developed by C.T. Beck (1995b), this checklist is based on 11 symptoms of postpartum depression identified in previous publications (Beck, 1992, 1993). This screening measure is a systematic guide for interviewing childbearing women to determine who should be referred for more in depth assessment. The checklist is not scored; nor has its reliability been explored for research purposes.

Maternal Depression and Mother-Infant Interaction

Maternal postpartum depression has been shown to negatively impact early mother-infant interactions (Beck 1995a; Field, 1992, 1997; Field et al., 1985; Murray, 1992). Literature reviewed on this topic includes studies examining face-to-face mother-infant interactions, the effect of maternal depression on infant behaviors and responsivity, and variation in interaction behaviors of mothers who are depressed.

Face-to-face interactions. Findings from numerous studies conducted when infants were two or three months of age show that depressed mothers exhibit flatter affects; they gaze less towards their infants, are less responsive, and stimulate their infants less in face-to-face interactions with their infants (Cohn, Campbell, Matias, & Hopkins, 1990; Cohn, Matias, French, Lyons-Ruth, & Connell, 1986; Cohn & Tronick, 1983, 1989; Field, 1984; Field, Vega-Lahr, Scafidi, & Goldstein, 1986). Reciprocally, infants of depressed mothers are less animated, less attentive, less active, less contented, more fussy, and demonstrate more negative interaction behaviors towards their mothers

(Cohn et al., 1990; Field; Field et al., 1985; Fleming, Ruble, Flett, & Shaul, 1988).

Differences in infants' responses to depressed and nondepressed mothers are demonstrated in a study by Cohn and Tronick (1983). Nondepressed mothers were asked to simulate depressive states by appearing flat faced and curtailing touch responses during interactions. Interestingly, infants of the nondepressed mothers showed more negative behaviors when their mothers appeared depressed. The infants displayed more protest, wariness, and gaze aversion behaviors which continued for a short time after normal interactions had resumed (Cohn & Tronick).

A replication of this study with clinically depressed mothers was conducted by Field (1984). Findings revealed that these infants did not change their expressions when mothers were asked to interact spontaneously and when they were instructed to look depressed. Also, in a subsequent study of three to six month old infants of depressed mothers, the negative interaction behaviors of the infants prevailed in face-to-face interactions with strangers (Field, 1992). Field suggests that infants mirror their mothers' expressions and that the infants' continuous expressions of depression may be a "defensive posture" developed when continuously exposed to their mother's depressed expressions (Field, 1992). Additional infant responses identified during compromised mother-infant interactions are a lowered behavioral state (predominantly drowsy), a less relaxed activity (more squirming and back arching), an increased fussiness, and a decrease in the number of contented expressions (Field, 1992). Field et al. (1985) query "whether the infants' depressed affect derives from their exposure to the depressed behavior modelled by their mothers or from minimal stimulation provided by their mothers" (p. 1155). A concern is the potential of negative long-term effects on the

infant's responsivity and the developing mother-infant relationship, possibly leading to an infant's emotional, social, and cognitive development being compromised (Gross, 1989).

Variances in maternal interaction behaviors and styles. Findings from studies suggest that depressed mothers interact with their infants in two ways, either by withdrawing or intruding (Cohn et al., 1986; Field, Healy, Goldstein, & Guthertz, 1990). Mothers who withdrew "were disengaged, unresponsive, and affectively flat; they did little to support their infants' activities." The infants of these mothers tended to be more distressed and to exhibit more fuss and cry behaviors. In contrast, mothers who intruded, "engaged in rough handling, spoke in an angry tone of voice; poked at their babies, and actively interfered with their infants' activities," found their infants disengaged from them, seldom looked at objects, and cried infrequently (Tronick & Weinberg, 1997, p. 67). However, these findings were not upheld in a study conducted by Murray, Fiori-Cowley, et al. (1996).

In the Murray, Fiori-Cowley, et al. (1996) study, depressed mothers were not found to be highly intrusive or withdrawn, but the investigators explain that this could be due to differences in the populations studied. The 100 participants in the Murray et al. study were from a large community sample of primiparous women whereas the Cohn et al. (1986) and Field et al. (1990) studies had smaller sample sizes, and participants were socially disadvantaged. Although differences were not extreme, Murray et al. found that the depressed mothers were less sensitively attuned and their responses were more negative and less affirmative to their infants. As well, the infants of the depressed mothers demonstrated more disruptive behaviors but infant engagement during interactions were similar to the infants of nondepressed mothers. Murray et al. argue

that the accentuated behaviors of withdrawal and intrusiveness in the mothers and pervasive distress and avoidance in the infants may be dependent on the combination of depression and social adversity rather than on depression alone.

Mothers' experiences of postpartum depression reported by Beck (1996c) provide an understanding of the meaning of the mothers' behaviors. Mothers described how the depression overtook their bodies and minds and how it interfered with them "reaching out to their infants and depriving them of any feelings of joy." They experienced inability to cope with the overwhelming responsibilities of infant care and reluctance to interact with or respond to their children as well as some anger towards the children; and at times mothers erected a wall "to separate themselves emotionally and physically from their children." (p. 101).

Infant Factors Associated with Maternal Postpartum Depression

Infant factors associated with maternal postpartum depression in the early months following a birth are identified as those related to the demands of infant caretaking, infant temperament, and infant behaviors such as crying, irritability, and poor motor functioning. While relationships between postpartum depression and these variables are identified, it is not known whether negative behaviors exhibited by the infant contribute to the initiation and continuation of maternal postpartum depression or whether the mother's depressive state promotes negative infant behaviors.

Demands of infant caretaking. Findings from several studies show that maternal depressive symptoms are related to maternal difficulties experienced when caring for the infant (Atkinson & Rickel, 1984; Cutrona, 1982; McIntosh, 1993; O'Hara et al., 1984). McIntosh lists these difficulties as never-ending demands of the infant, loss of freedom,

responsibilities of infant care, loneliness, isolation, lack of support, and lack of time for oneself. Other studies (Cutrona & Troutman, 1986; Fox & Gelford, 1994; Gross & Rocissano, 1988; Teti & Gelfand, 1991) show depressed mothers have lower levels of self-efficacy in caring for their infants, leading to increased stress and decreased feelings of competence in the maternal role.

Infant temperament and postpartum depression. An association between difficult infant temperament and postpartum depression has been identified in a literature review (Mayberry & Affonso, 1993), a meta-analysis (Beck, 1996b), and numerous studies (Cutrona & Troutman, 1986; Fox & Gelfand, 1994; Gross & Rocissano, 1988; Hopkins, Campbell, & Marcus, 1987; Mebert, 1991;Teti & Gelfand, 1991; Whiffen, 1988; Whiffen & Gotlib, 1989). Study findings show that that depression is greater among women who perceive their infants as less adaptable and unpredictable (Hopkins et al.) and more difficult (Whiffen, 1988). The outcome of the meta-analysis, of 17 studies conducted between 1985 and 1993 (Beck, 1996b) showed only a moderate correlation between postpartum depression and infant temperament. Beck noted that the strength of the relationship varied with sample size and with publication date of the study. More recent studies had larger sample sizes but the effect size was smaller. Beck suggests the relationship of the two variables reported in later studies may be more reliable.

Measurement of infant temperament and postpartum depression is also an issue in determining the relationship between these variables (Mayberry & Affonso, 1993). Mothers who are depressed tend to rate their infants as more difficult on self-report questionnaires but this could be due to several factors. Whether the mothers' ratings are accurate or biased by either their negative perceptions of their infants or their decreased

confidence in their parenting abilities is not known. As well, it is not known if the negative infant behaviors are the result of interacting with a depressed mother (Murray & Cooper, 1997; Whiffen & Gotlib, 1989). Using multimethods in studies for data collection for example, in observations of infant behavior and in questionnaires completed by mothers or professionals--would be more accurate for determining infant temperament. Of the studies cited above, only one (Cutrona & Troutman, 1986) used both observations of the infant and a self-report questionnaire to determine infant temperament. The second issue is the accuracy of measure used to determine whether a mother is depressed. Many studies have used the BDI, a self-report questionnaire with inconsistent reliability in detecting postpartum depression.

Infants and postpartum depression. Outcomes of numerous studies show that mothers who are depressed more frequently report longer periods of infant crying and fussiness (Cutrona & Troutman, 1986; Gotlib & Whiffen, 1989; Graff, Dyck, & Schallow, 1991; Miller, Barr & Eaton, 1993; Whiffen, 1988; Wilkie & Ames, 1986). This finding may be interpreted as a result of the mothers' depressed state but studies have been conducted that do not rely only on the mothers' reports. Cutrona & Troutman (1986) augmented maternal reports of their infants' behaviors with direct observations by professionals. Results at three months post delivery showed a positive correlation between difficult infant behavior and maternal postpartum depression. Comparisons of infant behaviors between depressed and nondepressed mothers are also reported in two studies. Infants of depressed mothers at two months of age were less content, more tense, and less tolerant of developmental testing (Whiffen & Gotlib, 1989), and at three to six months of age infants of depressed mothers received lower ratings in regard to

vocalizations, fussiness, physical activity, and face-to-face interactions (Field et al., 1985).

Two infant characteristics, namely poor motor functioning and irritability, have been shown to be predictors of postpartum depression among women identified as high risk for developing postpartum depression (Murray, Stanley, Hooper, King, & Fiori-Cowley (1996). Poor motor functioning in the infant, described as "hypo- or hyper-aroused behavior," increases the chance of postpartum depression eight times. Infant irritability, described as "immediate and distressed response to mild stimulation and failure to be readily soothed by adult interventions," increases the probability of postpartum depression three and one-half times (Murray & Cooper, 1997, p 117). The influence of infant irritability on a mother's depression is evident. However, the effect of an infant's poor motor function on a mother's depressive state warrants explanation. Possible reasons provided by Murray and Cooper are: that the caretaking activities for the infant with poor motor control may be more demanding for the mother and limit more satisfying interactions; that compromised infant behavioural patterns may curtail a sense of relatedness with the infant; and/or that infant movements that are "jerky and tremulous" or "flat and sluggish" may be disturbing to the mother (p. 119). Further study of this phenomenon is needed as well as more in depth examination of the infant's contribution to the depressive state of a mother.

The long term affect of postpartum depression on the infant is also a concern that is not well understood. Effects on infants whose mothers were depressed six months postdelivery and longer have been documented. Cognitive performances of these children have been shown to be lower at one year (Field, 1992), at 18 months (Murray,

1992; Murray, Fiori-Cowley, et al., 1996), and at four years of age (Coghill et al., 1986; Sharp et al., 1995). These findings were upheld even when a mother's postpartum depression was resolved by six months post delivery. Murray also found that children of mothers who were depressed during the first six months of life were less securely attached at 18 months of age. However, in a more recent study, Murray et al. contribute less secure attachment to the combination of postpartum depression and adversity in daily living.

Alternative findings by Field (1997) show that infants of depressed mothers who displayed depressive characteristics during the first six months of life did not show these characteristics or developmental delays at one year if their mother's depression was resolved by six months post delivery. Perhaps other determinants influenced the outcomes of the studies. Reparation of negative effects on infants due to a variety of factors has been shown to occur with early and relevant interventions (Shore, 1997).

Breastfeeding and Maternal Depression

Studies focusing on breastfeeding and postpartum depression are extremely limited: only four studies were located for this review. Two findings indicate that mothers with postpartum depression frequently report breastfeeding difficulties (Barton 1991; Hellin & Waller, 1992; Tamminen, 1988) and that they terminate breastfeeding prematurely (Cooper, Murray, & Stein, 1993; Hellin & Waller).

In a convenience sample of 100 women attending a breastfeeding clinic, Barton (1991) found that 33 % had scores on the EPDS indicating postpartum depression. These women reported significantly more breastfeeding problems than did those who had lower scores on the EPDS. The problems, similar to those cited by Tamminen (1988),

relate to insufficient milk supply and infant behaviors. Problems of infant behaviors include difficulty latching, infant crying or fussiness, disruptive infant sleep patterns particularly at night (Barton; Tamminen), infant gas, back arching and pulling off the breast during feeding, and regurgitation of milk (Barton, 1991). In another study, Hellen and Waller (1992) used the BDI to determine postpartum depression among women during pregnancy and postpartum and found an association between physical difficulties with breastfeeding and depression during pregnancy and but no relationship between breastfeeding problems and depression in the postpartum period.

In detecting the relationship between postpartum depression and early cessation of breastfeeding, Cooper et al. (1993) report that the onset of depression preceded weaning. Whether breastfeeding is discontinued because of the occurrence of depressive symptoms or because infant feeding difficulties engendered the depression is not clear.

In summary, maternal postpartum depression may influence the quality of a mother's interaction with her infant, compromising the early stages of communication and social integration (Papousek & Papousek, 1997). Long lasting effects on the mother-infant relationship and the child's development are related to the severity and duration of the postpartum depression. Difficult infant behaviors may affect a mother's depressive state and breastfeeding may also be compromised. Cooper et al. (1993) report a negative association between maternal depression and early termination of breastfeeding in that depression precedes early weaning from the breast.

Summary

Breastfeeding is a complex, dynamic, interactive process that is dependent on the characteristics, abilities, and behaviors both the mother and infant bring to the

partnership. The initiation and duration of this breastfeeding partnership will be affected by the mother's education, her age, her beliefs about breastfeeding, and her commitment and motivation to breastfeed. Also linked to breastfeeding, but with more questionable influence, are the variables of socioeconomic status and parity. The partnership will also be affected by the infant's ability to suck and swallow and to provide clear feeding cues such as signalling readiness to eat and satiation, infant fussiness and crying behaviors may negatively affect breastfeeding.

Support from a significant other and/or by family and friends has been identified as the most positive environmental factor facilitating mothers to breastfeed. Assistance from health professionals is still viewed as variable even though community peer support programs are now known to be instrumental in promoting breastfeeding among high risk groups. The breastfeeding relationship is dependent on how well the characteristics, abilities, and behaviors of the mother and infant fit together and how they adapt to each other. A relationship is enhanced when the partners "work in harmony."

Interaction between mothers and infants, described as an interlocking sequence of behaviors leading to a smooth flowing rhythmic system, is a changing dance that flows back and forth as two partners mutually adapt to one another. While mother-infant interaction has been frequently studied in the context of infant feeding, it has not specifically been related to breastfeeding. The few studies comparing breast- and bottlefeeding mothers and infants indicate that mothers who breastfeed interact with their infant more during feeding. Because feedings generally last longer, mothers and infants have more opportunity for "intimate social contacts." Eye-to-eye contact between mothers and infants, for example, is one of the first interactive exchanges that is

important for beginning social interactions and fostering positive interactions. A position for optimum eye-to-eye contact is the enface position, which occurs when the partners' eyes meet in the same vertical plane. As a result, attainment of this position during feeding is recommended to enhance mother-infant interactions (Barnard et al., 1989).

Observational research methods are more suited to studying interactive and infant behaviors than are questionnaires and interviews. Assessment scales are developed for examining mother-infant interactions at a global level and a micro level. Observational studies exploring interaction patterns during breastfeeding are not evident in the literature. Although studies delineating mother and infant touch during breastfeeding are limited, stroking and caressing have been identified as the most common touch among breastfeeding mothers. In one study it was noted that touch was reciprocal between the mother and infant but no studies were located describing infant touch during breastfeeding. As well, Infant temperament does influence both mother-infant interaction and breastfeeding in that mothers whose infants cry excessively terminate breastfeeding prematurely.

While the research presented here uses varying terminology the event of postpartum depression influences the quality of the mother-infant interaction. As well observations studies of face-to-face interactions a negative reciprocal effect on mother-infant interactions when mothers are depressed. The suggestion in some studies that mothers who are depressed may either withdraw or exhibit intruding behaviors when interacting with their infants supports the need for further research in this area. Finally, the infant factors most likely influencing maternal postpartum depression such as crying, caretaking demands, poor motor functioning, and irritability are reported in the literature

as negatively correlating with postpartum depression and a shorter duration of breastfeeding. Research needs to find the degree to which depression precedes early weaning.

Chapter 3: Methods

Overview

In this study mother-infant interaction during breastfeeding is examined and a comparison is made of interactions of mother-infant dyads in two groups: one wherein infants were perceived by their mothers as problematic breastfeeders and one wherein infants were perceived as nonproblematic breastfeeders. In this chapter the design of the study, the observational method utilized, and the study process in each of two phases are presented.

Design

An exploratory-descriptive-comparative design was used in this observational study. The primary method was to videotape and then examine the videotaped observations of breastfeeding sessions, identifying and describing types of mother-infant interactions. In the first phase, mother and infant behaviors were described in detail. From these descriptions, a coding guide of meaningful categories of behavioral patterns was developed. In the second phase the videotaped breastfeeding sessions were re-examined, using the coding guide, to compare the types of mother-infant interactions during breastfeeding for infants considered by their mothers as either problematic or nonproblematic breastfeeders. Additional comparisons between the breastfeeding groups were made when infants were two months of age. At this time, breastfeeding sessions were videotaped to compare mother-infant interactions at a more global level and mothers completed self-report questionnaires specific to their perceptions of their infant's temperament and their postpartum depressive state.

Observational research methods were used for the exploration, description, and comparison of the mother-infant interactions. Although observational methods have been used for numerous mother-infant interaction studies (Bakeman & Brown, 1977; Booth et al., 1984; Brazelton et al., 1974; Lester, Hoffman, & Brazelton, 1985; Lewis & Lee-Painter, 1974) and although many of these were during infant feeding (Barnard & Eyres, 1978; Field, 1977; Karger, 1979; Kaye & Wells, 1980; Paul et al., 1996; Price, 1983; Osofsky, 1976; Richards & Bernal, 1972), in depth examination of the *types* and *variances* of interactions during *breastfeeding* has not been undertaken by researchers. Hence, the ethological approach was appropriate for this observational study.

Ethology

Ethology is an observational method used for systematically observing, analyzing, and describing complex behavior patterns in a natural setting (Blurton Jones, 1972; Bottorff, 1994; Eibl-Eibesfeldt, 1989; Field & Morse, 1985; Morse & Field, 1995). The method was first used by zoologists for the study of animal behaviors in natural settings (Eible-Eibesfeldt, 1970; Ruwat, 1972) but it has been broadly adopted since the mid-1930's for the study of human behavior in the disciplines of anthropolgy, psychology, and medicine. Although this method has rarely been used nursing, it is well suited to clinical studies of individuals such as infants who cannot provide information to investigators through interviews or self-report questionnaires (Morse & Bottorff, 1990). The method starts with an inductive phase, and therefore, is apropriate for examining behaviors within a specific context and/or from a new perspective. A deductive phase follows to further examine and compare findings generated from the inductive phase.

This inductive phase, described as qualitative ethology (Bottorff, 1994), consists of detailed narrations of behavioral clusters and patterns are documented to generate an ethogram (Eibl-Eibesfeldt, 1989). This behavioral inventory, grounded in the data, is the basis of the observational coding guide.

In this study, videotapes of breastfeeding sessions were repeatedly reviewed in real time, in slow motion, and in frame-by-frame format to generate detailed observational notes of mother and infant behaviors. From this analysis rich descriptions of the mother and infant behaviors were formulated and developed into an ethogram. Based on the behaviors and interaction patterns identified in the ethogram, an observational coding guide of specific behaviors to code was developed, more focused research questions were evolved, and hypotheses for comparing the two breastfeeding groups were generated. In the second study phase, videotapes were re-examined, using the coding guide, and mother-infant interactions were analyzed and compared.

Phase One

Phase one consists of the establishment of a sample and a setting, of data collection, and the development of an ethogram and an observational coding guide.

Sample and Setting

Sample. Using a convenience, non-probability sampling technique, 24 mother-infant dyads were recruited for this study. To compare breastfeeding interactions that were perceived as problematic because the infant was disruptive at the breast with those viewed as nonproblematic, two groups of 12 dyads were recruited. The selection criteria for infants were first borns, whose birthweight ranged between 2500 to 4500 grams, had a gestation age of between 38 to 42 weeks, had no conditions or anomalies that

interfered with breastfeeding (e.g., a cleft palate or a neuromuscular disorder), and who were less than two months of age. Additional criteria for the problematic breastfeeding group included the mothers' identification of a disruptive breastfeeding pattern characterized by on-off behavior at the breast or frequent choking, gagging, sputtering, or crying during breastfeeding. Mothers in the comparative group identified their infants as nonproblematic breastfeeders. Infants from a multiple birth or who were sleepy, passive, or lethargic during breastfeeding were excluded from the study. The selection criteria for mothers were their being between 18 and 40 years of age, a first-time parent living with a husband or partner in the lower mainland of British Columbia, Caucasian and having the ability to read, write, and understand English as well as the absence of conditions or anomalies that would interfere with breastfeeding (e.g., breast reduction surgery or nipple inversion).

Following recruitment of a mother-infant dyad for the problematic breastfeeding group, a paired dyad for the nonproblematic group was sought. Infants were matched by gender, gestational age (within two weeks), birthweight (within 700 grams), and age at videotaping. Mothers were matched by age (within four years), years of education (within three years), and family annual income (within $10,000). Although an equal number of male and female infants were sought, only one female infant was identified that met the criteria for the problematic group, and thus the sample consisted of 22 male and 2 female mother-infant dyads.

Setting. Information about the study was distributed to health professionals in four maternity hospitals, seven community health units, and a breastfeeding centre. With their approval, community health nurses, midwives working in a hospital low risk

service, a lactation consultant employed in a hospital breastfeeding clinic, and a physician at a breastfeeding centre referred the 24 participants directly to the investigator. Throughout the 12-month recruitment phase the investigator frequently communicated with health professionals in each agency. To find a paired mother-infant dyad for the nonproblematic group, information about characteristics for matching was provided to health professionals recruiting mothers on an ongoing basis.

The investigator contacted all referred mothers by telephone. If they expressed interest in participating in the study, a home visit was made to explain the study, obtain informed consent, and make arrangements to videotape breastfeeding sessions in their homes. All those who were referred participated in the study.

Data Collection

Naturalistic observations of mothers and infants breastfeeding in their homes were videotaped at three intervals. The first videotaping session occurred when mothers in the problematic group consented to be in the study, which was between 22 and 69 days postdelivery, the second session was within 72 hours of the first, and the third session was when infants were two months old. The second breastfeeding session was videotaped to ensure that all behaviors of interest were captured for each mother-infant dyad. For the nonproblematic group, the first two breastfeeding sessions were videotaped at times similar to their paired mother-infant dyad. The videotapes of the third breastfeeding session were the observations for the NCAFS assessment.

Two digital Hi8 camcorders using Hi8 MP (metal particle) film were used to record the observations. The first camcorder, a Canon A1 mounted on a tripod, was placed six to eight feet in front of the mother and infant to record the overall interaction

patterns. The second camcorder, a Sony TR700 mounted on a monopod that was held by the investigator, was used to record behaviors at a different angle and closer to the infant during breastfeeding. The mobility of this second camera allowed it to be repositioned as the infant's position changed and thereby provided a more comprehensive data set. A microphone on a tripod was placed beside the mother and infant to capture their vocalizations. The videotaping commenced when the infant and mother were seated in a chair preparing to breastfeed and ended when the mother indicated that the feeding was over.

It is recognized that directly observing and videotaping participants can have reactive effects and influence participants' behaviors, such as behaving in a way they consider to be socially desirable (Gross & Conrod, 1991). However, the intrusion caused by the videotaping did not appear to present a problem, and mothers quickly became habituated to the presence of both the camera and the investigator. For these mothers, reactivity is thought to have been minimized for the following reasons: the mothers were cognizant of the investigator's interest in capturing naturally occurring breastfeeding behaviors; one camera was placed six to eight feet in front of the mother; only the investigator, who stood at the side or slightly behind the mother with the second camera, was present during the feeding session; and mothers were engrossed in the feeding process and the infant's breastfeeding behavior once the feeding started.

Following videotaping sessions the data were transferred to super video home system (SVHS) professional videotapes. The second set of tapes provided protection against accidental loss of data and permitted a vertical time code imprint (VTCI) to be stamped on the videotape. This imprint was essential to the operations of the Coder2

software program and the equipment used for examining and coding the observations. The use of SVHS equipment enhanced the quality of the data that were videotaped.

Additional data collected during the first two videotaping sessions were biographical information, a breastfeeding assessment, and the infant's weight. Observations of the feeding position, the infant's predominant state, latch, and suck, and the mothers' comments as to whether a feeding was typical were recorded as field notes following each session. Mothers were also provided with forms to record contacts with health professionals, family, or friends about breastfeeding and as appropriate, to describe the suggested intervention strategies indicating advice that was most or least helpful. These forms were collected at the two-month home visit.

At two months postpartum, a third feeding session was videotaped and mother-infant interaction was assessed using the Nursing Child Assessment Feeding Scale (NCAFS) (Barnard, 1978; Sumner & Spietz, 1994). Twenty-three participants were exclusively breastfeeding and one mother was in the process of weaning her infant. She chose to bottle-feed during the final videotaping session. Mothers also completed two self-report questionnaires, the Early Infancy Temperament Questionnaire (EITQ) (Medoff-Cooper et al., 1993) and the Edinburgh Postnatal Depressions Scale (EPDS) (Cox, 1986; Cox et al., 1987). Data from these questionnaires were used to describe characteristics of the mothers and infants and to compare the groups.

Instruments

Development of the Behavioral Coding Guide

Ethogram and major code development. Generation of an ethogram was the initial phase of developing the coding guide. Detailed descriptions of mother-infant

interactive behaviors during breastfeeding were recorded by repeatedly reviewing the videotapes using real time, slow motion, and frame-by-frame techniques. Interactions between mothers and infants were compared and contrasted, and behaviors were described and categorized. It was noted that throughout breastfeeding sessions, most mothers were consistently focused on their infant and sensitive to their infants' cues. However, differences in the nature and pace of mothers' and infants' behaviors were evident, and hence resulted in variances in their interactions.

For some mothers and infants, behaviors throughout a feeding session were smooth flowing rhythmic patterns that portrayed two partners waltzing in step to the same melodic tune (Barnard, 1978). For other dyads, feeding sessions were more disjointed. Although these partners were attuned to one another, they were often actively dancing to an offbeat, syncopated rhythm in which one partner was often slightly out of step. And, a few other dyads were completely out of synchronization, for example, one partner was relaxed and the other was tense or active. Types of attunements were variable within a feeding session and these patterns of interaction became the focus of the study.

Patterns of interaction were identified as harmonic attunement, disharmonic attunement, and disattunement. Each of these patterns, comprised of combinations of co-occurring mother and infant behaviors, became the structural units for coding and analyzing the mother-infant interactions. The major codes used for the mother's behaviors were the directions of her look, posture, and affect. Major codes distinguishing the infant behaviors were direction of the infant's look, his/her posture, and movement. *Harmonic attunement* was noted when mother and infant primarily looked

towards each other, when the mother was relaxed or showed minimal rigidity while attending to her infant, and when she exhibited a positive or neutral affect and the infant demonstrated a relaxed or minimally tense posture, with gentle, smooth movements. *Disharmonic attunement* occurred when the mother and infant primarily looked towards each other, when the mother's posture was tense and her affect was dull, and/or when she portrayed sadness or tolerance and the infant's posture was primarily tense and/or movements were rapid, jerky, or agitated. *Disattunement* occurred when one of the partners' behaviors was out of synchronization with the other in tension and/or activity. Ethogram descriptions also revealed when mothers and infants exhibited different kinds of touch during feeding sessions. It was noted that when feeding sessions were relaxed and calm, mothers often gently patted and stroked their and infants gentle touched their mother. As a result, two major codes were added to examine types of mother and infant touch during the identified interactions.

Enface positioning during breastfeeding became the ninth major code. Face-to-face or enface interactions between mothers and their infants are viewed as critical to infant development in regard to early communication (Field, 1977; Kaye & Fogel, 1980) attachment (Blehar et al., 1977) and early social interactions (Cohn & Tronick, 1987; Tronick, Als, & Brazelton, 1980). To encourage eye-to-eye contact and face-to-face interactions between mother and infant, the enface position has been suggested as optimal for infant feeding. The NCAFS designates that this should occur for 50 percent of a feeding session to receive a positive score. Yet the videotaped sessions in this sample offered evidence that mothers and infants rarely assume this position when the infant is feeding from the breast. The tenth major code, feeding, was used to determine

the duration of the feeding episode, the length of time the infant was on and off a breast, and the time spent positioning an infant at the breast.

Refinement of major codes and development of minor codes. Minor codes describing aspects of each major code were developed for the coding guide. As suggested by Bakeman and Gottman (1987), the term "event," rather than "behavior" is used throughout this study to refer to these behaviors. All codes were mutually exclusive and exhaustive, meaning that each code was associated with only one event (mutually exclusive) and that an exhaustive code could be identified for every event (Bakeman & Gottman). Each event was described as specifically as possible; however, observers were required to make judgments, for example, about the mother's affect, posture, or the infant's posture. This type of guide is referred to as a socially based coding scheme (Bakeman & Gottman).

The investigator created the codes with guidance from a researcher with expertise in developing observational coding guides and suggestions from others who are familiar with mother and infant breastfeeding behaviors. Previously developed mother-infant interaction scales and coding guides such as the NCAFS (Barnard, 1978) and the AMIS Scale (Price, 1983) were reviewed. Meaningful descriptors were modified and included; however, predefined guides did not fit with the interaction dimension observed by the investigator.

The final stage of developing the coding guide involved working with a research assistant who was familiar with coding videotaped behaviors. The investigator and assistant discussed, revised, expanded, and clarified codes until satisfactory interobserver agreement was achieved. The observational coding guide shown in Table 1 is comprised

of 10 major codes; four maternal, four infant, and two dyadic interaction codes. Three to five minor codes which are the differentiating descriptors, were developed for each of the major codes.

Table 1

Major and Minor Maternal, Infant, and Dyadic Behavior Codes

Maternal major codes	Maternal minor codes
Mother looks	1. Towards the infant's face or head including the infant's shoulders, upper chest and neck. 2. Towards the infant's body including the legs, trunk, and all parts below the upper chest. 3. Towards another person, animal, or object, or closes eyes.
Mother's touch[a]	1. No touch or body contact other than the hand or arm supporting the infant. Or the end of the breastfeeding episode. 2. Non-moving or holding touch with the second or non-supporting hand placed on the infant's trunk. Contact is continuous but the hand or fingers do not move. This may include a series of non-moving touches. 3. **Gentle** finger or hand patting, stroking, jiggling, or tapping. Or fingers or hand gently brushing the infant, always in the same direction. 4. **Firm** hand or finger patting, a firmer touch, often used while "burping" or calming an infant. A rubbing back and forth motion on the infant using the hand or fingers, firmer than stroking. 5. Caretaking touch, such as wiping the infant's face or restraining the infant's hand or arm. Also when the second (usually non-supporting) hand or arm is used for supporting or holding the infant during positioning at the breast or when the mother is transferring or shifting the supportive hand or arm.
Mother's posture	1. Limp, no movement, **drowsy to the point of possible unawareness.** Or the end of the breastfeeding episode. 2. Relaxed, the body is well supported, the arm not holding the infant is relaxed (e.g., the elbow is rounded and not sharply angular), hands and fingers are loose and rounded but not stiff or clenched, the facial muscles are not strained. Slow movement of arms or legs when the infant is breastfeeding. If rocking, a slow, gentle, soothing rock.

Table 1 (continued)

Maternal major codes	Maternal minor codes
Mother's posture (continued)	3. Relaxed but **slightly more rigid** and attentive in watching the infant, (e.g., the back is straight and the mother may bend slightly forward). The arms and legs slightly more angular (e.g., elbows slightly bent), the facial expression is slightly more intent. If rocking, it is a slow, even, soothing rock. 4. Tense, the body is more rigid, the arms angular at the elbows and legs can be angular at the knees (i.e., more angular than those bent for sitting; one leg may be crossed over another), hands are more rigid, toes angular, rigid or splayed, the position may be changed more frequently when breastfeeding, and arms and legs may move. Or, the mother is tense but rigid and not moving. If rocking, a faster motion. 5. Upright; walking with the infant to calm the infant (infant not on breast). Or the mother interrupts feeding to answer telephone or door bell.
Mother's affect	1. End of breastfeeding episode. 2. Appears positive and content; may smile occasionally, pleasant expression on her face that is directed towards the infant.. 3. Neutral, expressionless face or a "nothing" face (bland). 4. Dull or flat expression; eyelids almost closed or eyes glazed; and no expression on the face. 5. Sad, grimace, or expression of annoyance; a look of "tolerance," or impatience on mother's face.

Infant major codes	Infant minor codes
Infant looks	1. End of breastfeeding episode. 2. The head is in a position that could look at the mother. 3. Not looking in mother's direction, (e.g., when off the breast).
Infant's touch	1. Infant is not touching the mother other than being held by her during breastfeeding or burbing. Or designates the end of the breastfeeding episode. 2. Non-moving touch; the infant rests a hand or fingers on the mother or displays a series of holds or sliding touches. 3. **Gentle** finger or hand patting. Fingers or hands gently touch the mother more than one time in the same location; fingers are slightly rounded.

Table 1 (continued)

Infant major codes	Infant minor codes
Infant's touch (continued)	4. **Firm** patting, with the hand and/or arm, touching the mother more firmly, more than one time in the same location. Hand and/or fingers will be tenser, (e.g., splayed or in a fist). 5. Random touch, feet or legs kicking or flailing arm or hand; touches the mother more than one time in the same location.
Infant's posture	1. Completely limp like in a deep sleep. Or designates the end of the breastfeeding episode. 2. Relaxed; almost limp, sleepy, or drowsy. 3. Relaxed "comfortable" posture (i.e., little or no movement of hands, feet, arms, or legs, may **slightly** move fingers, hand, or foot). Movements are slow and co-ordinated; when not feeding "nestles" towards mother. 4. Tense, some rigidity and active movement of the arms and legs. The hands are frequently in a fist or splayed, the toes may be splayed, and/or a foot is angular in an upwards direction.
Infant's movement[b]	1. No activity, i.e., no noticeable movement of arms, hands, legs, or feet, during feeding. Or, designates the end of the breastfeeding session. 2. Slight, gentle, and smooth movement of **hand or fingers** (may be 1-3 fingers) or foot. 3. Slight movement of a limb, arm, leg, head, or trunk. Movements are infrequent, slow, and co-ordinated. 4. At least one hand/arm, or foot/leg, or head/trunk is moving in faster motion. Movements are quicker and tend to be "jerky." 5. More rapid motion of the arms and legs. The hands are tense, and the infant is agitated or distressed
Dyadic major codes	**Dyadic minor codes**
Enface[c]	1. End of breastfeeding episode. 2. Enface position. 3. Not in enface position.
Feeding[d]	1. End of the breastfeeding session 2. Positioning, starts when the mother is ready to feed and is trying to put the infant on the breast, (e.g., the infant is in the feeding position and the mother is making motions to bring the infant towards her with her hand or arm). Positioning may

Table 1. (continued)

Dyadic major codes	Dyadic minor codes
Feeding (continued)	reoccur during the breastfeeding session if the infant comes off the breast, (e.g., the mother burps or repositions the infant before putting the infant on the breast again. Not coded if the infant comes off the breast during the feeding but the mother's supporting arm or hand remains in the same position and is not repositioned.
Feeding (continued)	3. Infant on Right breast 4. Infant on Left breast. 5. Infant Off breast, must be off the nipple.

[a]Mother touch: touch excludes body contact and the arm that is holding or supporting the infant for feeding or "burping" but it includes patting or stroking touches made with the fingers or hand of the supporting arm or hand.

[b]Infant movement: includes movement of the infant's trunk and/or limbs but it does not include facial muscles required for sucking.

[c]Enface: the position in which the caregiver's face is rotated so that his/her eyes and those of the child's can meet fully in the same vertical plan of rotation. In addition to vertical alignment, they are horizontally aligned in the same plane. Eye contact need not occur to score yes. What is important is that the caregiver aligns himself/herself in this position. (NCAST Feeding Manual, 1994).

[d]Feeding: starts when the mother is positioning the infant at the breast and starts bringing the infant towards her. It ends when the infant comes off the breast for the final time.

In the analysis, maternal and infant behavior codes were combined to represent the three identified interaction types, harmonic attunement, disharmonic attunement, and disattunement. Descriptions of the code combinations are shown in Table 2.

Table 2

Combined Maternal and Infant Behaviors Representing the Interaction Types

Interaction type	Maternal major and minor codes	Infant major and minor codes
Harmonic attunement	Mother looks, 1 or 2 Mother's posture, 1 or 2 Mother's affect, 1 or 2	Infant looks, 1 Infant's posture, 1 or 2 Infant's movements, 0, 1, or 2
Disharmonic attunement	Mother looks, 1 or 2 Mother's posture, 3 or 4 and/or Mother's affect, 3 or 4	Infant looks, 1, Infant's posture, 3 and/or Infant's movements, 3 or 4
Disattunement	An interaction during feeding in which the combination of behaviors are dissimilar for each partner, for example, the mother may be of positive affect and relaxed, and the infant is tense and active, or the mother displays a negative affect, and the infant is relaxed and exhibits slow coordinated movements.	

Additional Observational Measure

Nursing Child Assessment Feeding Scale (NCAFS). This 76 item binary scale (see Appendix A) developed for assessing parent-infant interaction during feeding (Barnard, 1978) was used to examine mother-infant interaction at a global level, using the videotaped observations of breastfeeding sessions that were recorded when the infants were two months of age. The scale consists of four parent and two infant subscales that are indicators for assessing behaviors that both the mother and infant bring to the interaction described in the conceptual framework. Maternal subscales represent the sensitivity to the infant's cues, response to the infant's distress, social-emotional growth fostering activities, and cognitive growth fostering activities. Infant subscales represent the clarity of the infant's cues and the infant's responsiveness to the mother.

The NCAFS was one of two interaction rating scales developed in the 1970's for the Nursing Child Assessment Project (NCAP), a longitudinal study conducted at the University of Washington in which approximately160 mothers and their infants participated (Barnard et al., 1989). Since 1979, health professionals and teachers have been certified to screen mother-infant interactions using the NCAFS and the Nursing Child Assessment Teaching Scale (NCATS).

The psychometrics of the scales are based on data collected by the initial 2000 nurses who completed a Nursing Child Assessment Training (NCAST) program. Internal consistency reliability (Cronbach's alphas) for the six parent and infant subscales range from .56 to .69. For the total parent and total infant subscales the alphas are .83 and .73, respectively and .86 for the overall total score. Test-retest consistency computed from scores of 30 cases assessed when infants were one, four, eight, and 12 months, is reported as .75 for the parent score and .51 for the child score. The latter score is lower, as expected, because of infants' rapidly changing development.

Concurrent validity of the scale is supported by correlations with the NCATS, the Home Observation for the Environment (HOME) scale (Caldwell, 1978), and other interaction observation measures. Correlations between the NCAFS and the HOME were significant ($p < .01$) for all NCAF subscales; the correlations for the parent, child, and total scores were .48, .36, and .54, respectively. To determine predictive validity, the NCAFS scores were correlated with scores of the Bayley Mental Development Index when infants were three and 10 months of age. Although significant correlations were not evident at three months, they were at 10 months for four of the subscales and the parent, child, and total scores. Construct validity was estimated by differentiating

subjects with interaction problems, such as preterm infants from fullterm infants, and infants with failure-to-thrive due to interactional problems rather than organic causes. Because of the small sample size, these results are considered a trend that is contributing to the construct validity of the scale (Barnard. et al., 1989).

Following data collection, a research assistant who was blind to the two breastfeeding groups coded the NCAFS data. The assistant had been trained and certified to use the NCAFS. Certification requires that an individual achieve a minimum interrater reliability of 85 percent agreement with NCAST standard scores on videotaped feeding sessions developed for NCAST certification.

Self-Report Measures

Two self-report measuring tools were chosen: The Early Infancy Temperament Questionnaire and the Edinburgh Postnatal Depression Scale.

Early Infancy Temperament Questionnaire (EITQ). This self-report questionnaire (see Appendix B) is specific to a mother's perceptions of her infant's temperament between one to four months of age (Medoff-Cooper et al., 1993). In the framework guiding this study, temperament is an infant characteristic that can influence the interaction. Similar to the Infant Temperament Questionnaire (ITQ) previously developed and revised (Medoff-Cooper, Carey, & McDevitt, 1990) this new questionnaire is conceptually based on nine temperament categories identified by Thomas and Chess (1977): activity, rhythmicity, approach, adaptability, intensity, mood, persistence, distractibility, and threshold. During its development the questionnaire was completed by 404 mothers of infants between one and four months of age who were recruited from one private pediatric practice in the Eastern United States. The

questionnaire is comprised of the following: 76 items rating the infant's behavior on a 6-point scale; nine items rating parents' comparisons of their perceptions of their infant with other infants of similar age on a 3-point scale; one item rating the infant's general temperament on a 3-point scale; and two open ended questions describing the infant's temperament. Internal consistency was determined for sub-groupings of infants between one to two, and three to four months. For the one to two month sub-group, the alpha coefficients for internal consistency for the nine temperament categories ranged between .43 and .76 and test-retest reliabilities, at two to three week intervals, ranged between .48 to .80. Standardized mean scores and standard deviations for each sub-group are available for assessing each of the temperament categories (Medoff-Cooper et al., 1993). Validity of this questionnaire has not yet been established although predictive validity using correlations with scores from the Revised Infant Temperament Questionnaire administered when infants are older are planned by the authors (Medoff-Cooper et al., 1993).

Edinburgh Postnatal Depression Scale. This 10 item self-report questionnaire (see Appendix C) was developed for use by community health professionals who are in contact with women in the early weeks and months following their infants' births, to screen for postnatal depression. In this study, identification of mothers who are depressed is important because it is a maternal factor that has been shown to influence the mother-infant interaction. The EPDS is a self-report measure that is easy to administer and is well accepted by mothers in Great Britain (Cox et al., 1987), North America (Reighard, & Evans, 1995), Sweden (Lundh & Gyllang, 1993), and the Netherlands (Pop et al., 1992).

From a possible high score of 30 on the EPDS the score used for determining if a woman is mildly depressed is suggested as 9 or 10 and clinically depressed as 12 (Cox et al., 1987; Reighard & Evans., 1995; Roy et al., 1993).

Studies reporting estimates of the reliability and validity of this relatively new measure are steadily increasing. The internal consistency, determined by a split-half reliability procedure, was reported as .87 (Cox et al, 1987) and .82 (Pop et al., 1992). Sensitivity--which is the proportion of women correctly identified as clinically depressed, validated by psychiatric evaluations--is reported in two studies; as involving women scoring 12.5 on the EPDS. Study findings report the sensitivity as 86 % (Cox et al., 1987) and 95 % (Harris et al., 1989). However, samples in both studies were not randomly selected and the latter study has methodological limitations, such as that the EPDS was completed after a psychiatric interview that may have sensitized some of the respondents. In a study by Murray and Carothers (1990) with a representative sample of 646 women who were six weeks postdelivery, findings reveal the scale is sensitive in correctly identifying 81.1 % of the women who have a major depression and 52 % of those with a minor depression. The authors suggest an overall sensitivity of 67.7% for depression when a women's score is 12.5. This estimate is lower than the two previous studies but is regarded by Murray and Carothers as more accurate. Additional findings from the Murray and Carothers study reveal that the EPDS has a specificity (meaning the proportion of non-depressed women correctly identified) of 95.7 % for a score of 12.5. In addition, Cox et al. report a sensitivity to assessing changes in depression over an 11-week period.

Validity, indicated by the positive predictive value is the proportion of women with a positive test who actually are depressed; it is reported as 73 % (Cox et al., 1987), 75 % (Harris et al., 1989), 67 % (Murray & Carothers, 1990) and in Sweden 76 % (Lundh & Gyllang (1993).

Additional Data Collection Guides

Data collection guides were constructed to systematically collect information about the characteristics and breastfeeding attributes that the mother and infant brought to their interactive relationship within the context of breastfeeding. Factors in their environments were of particular interest since these support systems could influence the breastfeeding relationship.

Biographical Information Guide. The mothers completed this guide (see Appendix D), with the assistance of the investigator during the first or second visit. It provided information about the mother's labor and delivery as well as about infant feeding methods and difficulties post-delivery, support systems, and demographic characteristics.

Breastfeeding Assessment Guide and Feeding Information Form. The Breastfeeding Assessment Guide (see Appendix E) was completed by the investigator following the first breastfeeding session and the Feeding Information Form was completed on subsequent visits. Assessment data on the infant's and mother's breastfeeding attributes were recorded. Anecdotal notes about the feeding included the following: the infant's suck, latch, and state during the majority of the feeding; difficulties or concerns that a mother had about her breasts or nipples; the mother's identification as to whether the breastfeeding session was typical or atypical; and the

mother's description of the infant's recent feeding pattern.

Mothers' Notation Forms. Two mothers' notation forms, one for family and friends and one for health professionals (see Appendix F), were completed by the mothers between the first and third observational visits. These self-report forms provided descriptive data about the breastfeeding support they received. The assistance and advice mothers were given about breastfeeding and whether the assistance and advice was helpful or not helpful was recorded by the mothers.

Construction and face and content validity of the guides. The guides were constructed to collect data most relevant to the purpose and conceptual framework of this study. Following their completion, two mothers whose infants were less than two months of age pilot tested all guides and they were subsequently refined. Next they were reviewed by three maternal-child nurses, all researchers, two of whom are practitioners in this specialty area. All agreed that the guides had face validity. The development process of the Breastfeeding Assessment Guide and Feeding Information Form contributes to the content validity of these guides. The content was developed by reviewing breastfeeding assessment tools reported in the literature (Matthews, 1988; Mulford, 1992; Shrago and Bocar, 1990; Walker, 1989). The Biographical Information Guide was a revision of a similar questionnaire developed for research purposes by Ellis and Hewat (1984) that was considered to have content validity.

Phase Two

Phase two comprises the study's hypotheses, its definitions, its data coding procedure, and the observer agreement and reliability and validity of the observational coding guide.

Hypotheses

Hypotheses evolved based on the study purpose and the observed behaviors recorded on the videotapes. The initial hypotheses for this study were:

1. Mother-infant dyads whose infants are perceived as problematic breastfeeders will have similar scores on the Nursing Child Assessment Feeding Scale (NCAFS) as mother-infant dyads whose infants are perceived as nonproblematic breastfeeders.
2. Mothers whose infants are perceived as problematic breastfeeders will not rate their infants' temperaments on the Early Infancy Temperament Questionnaire (EITQ) significantly differently than will mothers whose infants are perceived as nonproblematic breastfeeders.
3. Mothers whose infants are perceived as problematic breastfeeders will have significantly higher scores on the Edinburgh Postnatal Depression Scale (EPDS) than will mothers whose infants are perceived as nonproblematic breastfeeders.

Hypotheses generated from the behaviors during breastfeeding sessions observed in Phase One of the study were the following:

4. Mother-infant dyads whose infants are perceived as problematic breastfeeders will interact in harmonic attunement for less time than will mother-infant dyads whose infants are not perceived as problematic breastfeeders.
5. Mother-infant dyads whose infants are perceived as problematic breastfeeders will interact in disharmonic attunement for longer time periods than will mother-infant dyads whose infants are not perceived as problematic breastfeeders.

6. Mother-infant dyads whose infants are perceived as problematic breastfeeders will exhibit longer periods of disattunement than will mother-infant dyads whose infants are not perceived as problematic breastfeeders.
7. Infants perceived as problematic breastfeeders will detach for longer proportions of the feeding sessions than mother-infant dyads whose infants are not perceived as problematic breastfeeders.
8. Types of mother touch will be different when the infant is perceived as a problematic breastfeeder than when perceived as a nonproblematic breastfeeder.
9. Types of infant touch will be different when the infant is perceived as a problematic breastfeeder than when perceived as a nonproblematic breastfeeder.
10. Infants will spend less than 50 percent of the feeding session in the enface position.

Definitions

Breastfeeding session. The time from when a mother positions her infant to feed at the breast to when the infant comes off the breast for the final time.

Problematic breastfeeder. An infant whose mother perceives her infant's behavior at the breast as on-off or if disruptive patterns occur such as frequently choking, gagging, sputtering, or crying during breastfeeding.

Harmonic attunement. Mother-infant interaction behaviors during breastfeeding that are co-ordinated and smooth in nature. These include the following concurrent behaviors: the mother primarily looks towards her infant, her posture is a relaxed but attentive, and she exhibits a pleasant facial expression; the infant primarily faces his/her mother, his/her posture is relaxed or minimally tense, and his/her movements are slow and co-ordinated.

Disharmonic attunement. Mother-infant interaction behaviors, during breastfeeding, that are active and tense in nature. These include the following concurrent behaviors: the mother primarily looks towards her infant; her posture is rigid and/or tense, and/or she exhibits a dull, flat or sad facial expression; the infant primarily faces his/her mother; his/her posture is tense; and/or his/her movements are rapid and "jerky."

Disattunement. Mother-infant interaction behaviors, during breastfeeding, in which the behaviors of each partner are concurrently dissimilar. For example, the mother is relaxed and exhibits a positive affect and the infant is tense and/or active.

Mother-infant interaction (global level). Mother-infant interaction assessed by the Nursing Child Assessment Feeding Scale.

Infant temperament. A mother's perceptions of her infant's temperament assessed by the Early Infancy Temperament Questionnaire.

Postpartum depression. A mother's depressive state assessed by the Edinburgh Postnatal Depression Score.

Enface position. According to Kennell (1974), "the position of the mother's face held so that her eyes and those of her infant meet fully in the same vertical plane of rotation" (p. 174); and according to the NCAST Feeding Manual (Sumner & Spietz, 1994) ". . . in addition to vertical alignment, they are horizontally aligned in the same plane. Eye contact need not occur . . . . What is important is that the caregiver aligns himself/herself in this position . . .." (p. 174)

Data Coding Procedure

Data coding was facilitated for this study using a Coder2 software computer program that enables events to be coded directly from videotapes in real time, slow

motion, or frame-by- frame and entered into a computer ASCII file. Time duration of events was originally coded to 1/30th of a second, and all times were converted to seconds for data analysis. The use of mutually exclusive and exhaustive codes permitted coding of the frequency and time duration of the events because the offset of one code was the onset of another (Bakeman & Gottman, 1986).

Research assistants, blind to the two breastfeeding groups, coded all of the data. Coding done by the investigator was used to confirm that the description of the codes truly represented the events, ensured coding ease, and established interobserver agreement with the research assistants.

All events were coded on the videotape that showed the overall mother-infant interaction; however, during the coding, the two videotapes of each feeding session were coordinated to run simultaneously on side by side monitors. This arrangement augmented observations and enhanced decisions about coding. If events were viewed more clearly on the second or close-up videotape, that tape was used to code the events and the codes were transferred to tape one for analysis. The major codes most frequently determined on the second videotape were feeding, infant touch, mother touch, and infant movement.

Videotapes were initially viewed in real time to sensitize the observer to the behaviors of the mother and infant during breastfeeding. This was followed by a minimum of 10 passes in slow motion or frame-by-frame for coding all of the major codes. This procedure enhanced the coding precision.

Initially one research assistant coded all events, but the intensity of the coding procedure forced a time limit of 3.5 hours a day in which any observer could do this job

accurately. To hasten the coding phase of the study, a second research assistant was trained. In the 10 months required to complete the coding, the first research assistant coded all major groups for the first three months. The second research assistant coded mother look and infant look for the first two months, then added enface, mother posture, and infant posture for the last five months of the coding period. All of the most complex major codes namely, mother affect, mother touch, infant touch, and infant movement were completed by the first research assistant.

Observer Agreement, Reliability, and Validity of the Observational Coding Guide

Of critical importance in observational research is determining the accuracy, precision, and consistency of data. Two approaches used in this study are observer agreement and statistical reliability (Booth & Mitchell, 1988).

Observer Agreement. Observer agreements were determined for all observations made by the three observers coding the data. For each agreement, observation of the events and their duration for each major code was recorded for an entire breastfeeding session. The mutually exclusive and exhaustive events were coded to $1/30^{th}$ of a second but converted to the nearest one second for analysis. Agreement was recorded for each one second interval in which codes were the same between the two observations (Repp, Harman, Felce, Acker, & Karsh, 1989). The agreements were computed using two statistical measures.

Statistical measures used were Cohen's Kappa coefficient and percent agreement to determine observer agreement. The Kappa coefficient, which is the most stringent statistic and the measure of choice, computes total point by point agreement and corrects for agreement due to chance. Construction of an agreement matrix is comprised of

tallies of two observers' codings, illustrating agreement on the diagonal and disagreement off the diagonal. Identification of disagreements was useful in determining if one observer is more sensitive to the coding than the other if retraining of an observer is indicated or if descriptors of an event should be expanded or clarified. Acceptable levels of Kappa vary among observational researchers; Cichetti (1984) suggests .60 as appropriate whereas Bakeman & Gottman (1986) advise .70, and Fleiss (1981) proposes .40 to .60 be considered fair, .60 to .75 be considered good, and over .75 be considered excellent.

When possible, Cohen's Kappa coefficient was estimated for each of the 10 major codes. However, a limitation of the Kappa statistical procedure is that for computation to occur, the two comparative observations must include exactly the same type of events or minor codes and more than one event for the major code. When a Kappa coefficient was not computed, percentage agreement, a less rigorous calculation was determined. The expected coefficient of a percentage agreement is higher because chance agreements are included in the computation. An acceptable percent agreement is 85% or more (Booth & Mitchell, 1988) or, depending on factors such as the number of codes in a coding guide, 90% may be a preferred cut-off (Bakeman & Gottman, 1987).

Interobserver agreement, the extent of agreement between two observers coding the same observations, is a method for determining the accuracy and precision of a coding system. This type of agreement was computed following a lengthy training period to clarify descriptions of events and to compare events coded. Initially these estimates were determined for the minor codes recorded on the same observations by the investigator (Observer One) and the first research assistant (Observer Two). When the

second research assistant (Observer Three) was hired, interrater agreements were determined for paired observations coded by each of the three observers as Observer Three learned minor codes for specific major codes. Interrater agreements were calculated on a third occasion which was halfway through the coding phase, to determine if the observers were staying "true" to the coding guide as the coding progressed. Agreements at each observation time are for the major codes that Observer Two and Observer Three were coding at that time.

Interrater agreements between Observer One and Observer Two were calculated on three occasions. The first two agreements were for two subjects at the beginning of the coding period, following training. The third observation took place in the second half of the coding period. The agreements between the major codes that were coded on the three occasions are shown in Table 3.

At the time of the first two observations, Observer Two was coding all major codes. When agreements for the third observation were computed, Observer Two was coding only four major codes, mother touch and posture and infant touch and movement. Hence the interrater agreements calculated at the time of the third observation were for the major codes that Observer Two was coding.

The Kappa coefficient was not calculated in observation 1 for two major codes, infant touch and infant movement. For infant touch, only the event designated as "no touch" was recorded by both observers throughout the feeding session. As previously described, the Kappa coefficient is not calculated when only one event in an observation is coded. In this feeding session, other than the contact the infant had feeding at his mother's breast, he did not reach out and touch his mother with his hands, arms, legs, or

feet. For infant movement, Observer One recorded events as "no activity" and "slight movement of a limb" whereas Observer Two added the event designating "slight movement of a hand or fingers." Because this third event was added by Observer Two, the Kappa coefficient was not calculated.

Table 3

Interobserver Agreement for Kappa (K) and Percentage Agreement (PA) Between Observers One and Two for Three Observations

	Observation 1		Observation 2		Observation 3	
Subject	18		13		12	
Observation second	n = 372		n = 1783		n = 650	
Major code	K	PA	K	PA	K	PA
Mother look	.96	.983	.98	.996		
Mother touch	.96	.975	.99	.99	.92	.951
Mother posture	1.00	1.00	1.00	1.00		
Mother affect	1.00	1.00	1.00	1.00	1.00	1.00
Infant look	1.00	1.00	.96	.89		
Infant touch	NA	.92	.98	.993	.98	.988
Infant posture	1.00	1.00	1.00	1.00		
Infant movement	NA	.992	.98	.988	.94	.996
Enface	.89	.997	.95	.992		
Feeding	1.00	1.00	1.00	1.00		

Note. NA indicates that the Kappa statistic was not calculated because one observer coded an event that was not coded by the second observer.

Interobserver agreements were calculated between Observer One and Observer Three on each of three occasions. Observation 1 took place when Observer Three started coding. Initially, she coded mother look and infant look; hence, agreements were

only computed for these two major codes. In her third month of coding, Observer Three added mother posture, infant posture, and enface to her coding repertoire, and these agreements are shown observation 2. The agreements computed in the latter half of the coding phase are those shown in observation 3. The interrater agreements for Observer One and Observer Three are reported in Table 4.

Table 4

Interobserver Agreement for Kappa (K) and Percentage Agreement (PA) Between Observers One and Three for Three Observations

	Observation 1		Observation 2		Observation 3	
Subject	13		18		12	
Observation seconds	n = 1783		n = 372		n = 650	
Major code	K	PA	K	PA	K	PA
Mother look	. 80	. 96	.98	.998	.96	.997
Mother posture			1.00	1.00	.96	.998
Infant look	.95	.99	1.00	1.00	1.00	1.00
Infant posture			.98	.997	.96	.994
Enface			1.00	1.00	1.00	1.00

The interobserver agreements between Observer Two and Observer Three were calculated at the same observation times as those reported for Observer One and Observer Three. These results are shown in Table 5.

Intraobserver agreement represents the extent of agreement between coded observations of the same events done at different times by one observer. It is a method for determining consistency over time and guarding against observer drift. For each of the three observers, agreements were calculated for observations made at the beginning

and towards the end of the coding phase for the major codes that they coded throughout the study. The events and their duration for each major code were recorded for an entire breastfeeding session. However, if only one event within a major code was recorded throughout the session, additional observations of subjects who showed greater variance in types of events within the major code, were observed. One advantage of using videotaped observations is the availability of data that was previously coded for recoding at a later date to estimate intraobserver agreement. Both research assistants and the investigator recoded breastfeeding sessions to determine consistency over time and estimate the extent of observer drift.

Table 5

Interobserver Agreement for Kappa (K) and Percentage Agreement (PA) for Observers Two and Three for Three Observations

	Observation 1		Observation 2		Observation 3	
Subject	13		18		12	
Observation seconds	n = 1783		n = 372		n = 650	
Major code	K	PA	K	PA	K	PA
Mother look	.80	.90	.97	.987	.98	.998
Mother posture			1.00	1.00	1.00	1.00
Infant look	1.00	1.00	1.00	1.00	1.00	1.00
Infant posture			1.00	1.00	.98	.997
Enface			1.00	1.00	1.00	1.00

Intraobserver agreements for Observer One are reported in Table 6. Since only one event was recorded for the major codes mother posture, mother affect, and infant posture on the two observations compared, breastfeeding sessions for two additional

subjects were made for coding these specific major codes.

Table 6

Intraobserver Agreement for Kappa (K) and Percentage Agreement (PA) for Major Codes for Observer One for Three Subjects

Subject	13		12		1	
Observation seconds	n = 1783		n = 650		n = 355	
Major code	K	PA	K	PA	K	PA
Mother look	.95	.989				
Mother touch	.98	.989				
Mother posture	1.00	1.00	.998	.98		
Mother affect	1.00	1.00			.88	.949
Infant look	1.00	.999				
Infant touch	1.00	1.00				
Infant posture	1.00	1.00	.95	.995		
Infant movement	.98	.989				
Enface	.94	.99				
Feeding	1.00	.99				

Intrarater agreements for Observer Two are shown in Table 7. For this mother and infant only one event was coded on each occasion for the major codes mother posture, mother affect, infant look, and enface. Since mother affect was the only major code that Observer Two coded for the latter half of the coding phases, an additional observation was made of a second subject to code variance in this major category.

Table 7

Intraobserver Agreement for Kappa (K) and Percentage Agreement (PA) for Major Codes for Observer Two for Two Subjects

Subject	18		4	
Observation seconds	n = 372		n = 500	
Major code	K	PA	K	PA
Mother look	.97	.995		
Mother touch	NA	.967		
Mother posture	1.00	1.00		
Mother affect	1.00	1.00	.91	.958
Infant look	1.00	1.00		
Infant touch	.96	.984		
Infant posture	1.00	1.00		
Infant movement	.96	.987		
Enface	1.00	1.00		
Feeding	1.00	1.00		

Note. NA indicates that the Kappa statistic was not calculated because the event "caretaking" touch was coded in the second but not the first observation.

Intrarater agreements for Observer Three are shown in Table 8. A second observation was coded for the enface major code because only one event was coded in this major code in the first observation.

The Cohen's Kappa coefficients computed for this study are consistently and exceptionally high. Except for two .80 coefficients for the major code *Mother look* in interrater agreement observations between observers One and Three and Two and Three, when Observer Three was learning the codes, all results range between .91 and 1.0. Since levels over .75 are considered excellent (Fleiss, 1981) these findings indicate

consistency and accuracy in coding events and using the coding guide. The percentage agreements for determining inter- and intraobserver agreements are all over the acceptable level of 85 % to 90 % (Booth & Mitchell, 1988; Bakeman & Gottman, 1986). One observation between Observers Two and Three for the major code, mother look, was computed at 90 % but the majority are in the upper nineties and many show 100 % agreement. The numerous inter- and intraobservation agreements indicating a Kappa of 1 and 100 % percentage agreement should be interpreted with caution. Many are for major codes such as mother posture and affect, infant posture, and enface, in which a behavior has minimally changed throughout a breastfeeding session. Also contributing to these results are the strategies used in this study that facilitated accurate and consistent observational coding.

Table 8

Intraobserver Agreement for Kappa (K) and Percentage Agreement (PA) for Major Codes for Observer Three for Two Subjects

Subject	12		13	
Observation seconds	n = 650		n = 1783	
Major code	K	PA	K	PA
Mother look	1.00	.99		
Mother posture	.96	.99		
Infant look	1.00	1.00		
Infant posture	.98	.989		
Enface	1.00	1.00	.92	.966

Note. NA indicates that the Kappa statistic was not calculated because of discrepancies in events coded in the two observations that were compared.

First, the use of videotapes permitted observers to repeatedly replay observations

in slow motion and frame-by-frame until a decision about recording an event and its duration was made (Gross & Conrad, 1991). Second, the observers were carefully selected: the first observer had experience in observational research, coding events from videotapes and knowledge about and interest in human behaviors, particularly those of mothers and infants; the second observer was knowledgeable about mothers and infants, had excellent decision-making abilities, and demonstrated exceptional technological skills which were important for using the coding equipment. Third, the training period for using the coding guide was intensive and discussions among the observers about event descriptors or coding specific events was ongoing throughout the coding phase. And fourth, coding precision was enhanced by using the Coder2 software program that enabled events to be coded in $1/30^{th}$ of a second, directly from the videotape to a computer file for analysis.

Inter- and intraobserver agreements indicate the reliability of the use of the coding system. The observer agreements in this study suggest that the developed coding guide was reliable within the context of this study and that the guide would be suitable for use in similar studies if observers were trained to use it. However, high levels of agreements do not indicate consistency of mother and infant behaviors over time. Statistical reliability is determined by comparing observations of the same subjects made on separate occasions (Booth & Mitchell, 1988).

Statistical Reliability. To determine the stability of the identified behaviors and interaction patterns over time, statistical reliability was calculated (Booth & Mitchell, 1988). This was estimated by comparing each of the major behavior codes recorded in the first and second feeding sessions, for each of three mother-infant dyads. The ranges

in time between the two feeding sessions for the three dyads were four hours for dyad 12, 50 hours for dyad 18, and 66 hours for dyad 13. For each dyad, the proportion time distribution in each major code was compared for session one versus session two using a chi-square test. Major codes observed for less than .05 proportion of the session were aggregated within each major code. Thirty-three paired, major codes (11 for each of three dyads, that were comprised of four maternal, four infant, two dyadic major behavior codes, and one interaction major code) from the first and second feeding sessions were compared. Using the chi square test and a probability value of .05, eight comparisons were statistically different but these findings must be interpreted with caution.

Statistical compromise in comparing the three observations is evident for three reasons. First, it is recognized that a chi square test assumes that observations are independent and the proportions used in these analyses were not independent. Violating the independence assumptions has an equivalent effect to reducing the test's degrees of freedom, and, as a result, the reported tests may produce Type I errors, that is, significant differences may be declared where no actual difference exists. Second, a statistical effect that may contribute to inflation of the number of significant outcomes is that tests were calculated for 11 major codes for each mother-infant dyad. When numerous tests are done for one dyad, a proportion of the significant outcomes may be due to chance alone (Booth & Mitchell, 1988). Hence eight significant differences may be an inflated number. Third, although minor behavior codes that were less than .05 proportion of a feeding session were aggregated with similar behaviors for analyses, it was not possible to do this for all, for example, in Table 9, the mother's touch excluded

minor codes firm, rub, and caretaking from the analyses, and, for dyad 18, only .0 3 proportion of observation 1 was spent using a rubbing touch. As a result these statistical analyses may not be sufficient evidence to determine that the behaviors between two feeding sessions are not stable or consistent.

The proportions of each of the observations purported to be significantly different are shown in Tables 9, 10, 11, and 12 so that differences may be considered. Mother touch, reported in Table 9 was the one maternal major code that changed between feeding sessions for each of the three dyads. Changes between feeding sessions for all three dyads are evident between no touch and non-moving touch and in gentle touch for two dyads. The clinical reality is that all mother and infant behaviors are not exactly the same at every feeding session.

Table 9

Differences in Mother Touch Between Two Feeding Sessions for Dyads 12, 13, and 18

Mother Touch	Dyad 12		Dyad 13		Dyad 18	
	Proportion of Feeding					
	1st	2nd	1st	2nd	1st	2nd
No touch	.78	.19	.08	.62	.47	.16
Non-moving	.15	.45	.55	.17	.43	.60
Gentle	.06	.35	-	.05	.08	.24
Firm	-	-	.14	.03	-	-
Rub	-	.01	-	.05	.03	-
Caretaking	.01	-	.23	.08	-	-

Note. Statistical differences between each set of feeding sessions are χ^2, $p < 0.001$ The proportions of a feeding session may not equal 1.0 because proportions were adjusted to the nearest 1/100th.

Differences in infant behaviors between the paired feeding observations occurred for three infant major codes. These were the infant's posture for dyad 12, the infant's movement for dyad 13, and the infant's touch for dyad 18. These differences are shown in Table 10.

Table 10

Differences in Infant Behaviors Between Two Feeding Sessions for Dyads 12, 13, and 18

Infant posture			Infant movement			Infant Touch		
Dyad 12			Dyad 13			Dyad 18		
				Proportion of Feeding				
	1st	2nd		1st	2nd		1st	2nd
Limp	-	-	No activity	.62	.56	No touch	1.00	.77
Relaxed	-	-	Slight finger/			Non-moving	-	.10
Slightly tense	1.00	.91	hand/foot	.47	.02	Gentle	-	.07
Tense	-	.09	Slight, limb	.16	.06	Firm	-	.07
			Fast/jerky	.16	.33	Kicking	-	-
			Rapid	-	.03			

Note. Statistical differences between each set of feeding sessions are χ^2, $p < 0.001$ The proportions of a feeding session may not equal 1.0 because proportions were adjusted to the nearest 1/100th.

Comparisons between mother touch and infant movement behaviors for each dyad, shown in Tables 9 and 10, can lead to speculative interpretations of the type of touch a mother used in relation to her infant's behavior. The mother in dyad 12 touched her infant more during the feeding in which her infant showed greater tension. Could her non-moving touches or her gentle strokes or pats be in response to the infant's tension? Increase in maternal soothing behaviors that are contingent on infant behaviors such as

increased tension are characteristic of positive mother-infant interaction (Barnard, et al, 1989).

For dyad 13, a couple disattuned for most of both feeding sessions, the mother touched her infant less, and the infant was more active in the second feeding session. Could the mother's touch in the first feeding session have had a calming effect on the infant's activity? For dyad 18, a couple harmonically attuned throughout the two feeding sessions, both mother and infant touched each other more during the second feeding. Increased touching was reciprocal: just which partner had the greatest influence was not determined.

Differences in types of interaction between two feeding observations were shown for dyad 12 and are reported in Table 11.

Table 11

Differences in Mother-Infant Interaction Between Two Feeding Sessions for Dyad 12

Interaction	Proportion of feeding	
	1st	2nd
Harmonic attunement	1.00	.82
Disharmonic attunement	-	.07
Disattunement	-	.17

Note. Statistical differences between each set of feeding sessions are χ^2, $p < 0.001$ The proportions of a feeding session may not equal 1.0 because proportions were adjusted to the nearest 1/100th.

This had been perceived as a problematic breastfeeder; however, during the first feeding, observation the mother reported that the infant's disruptive feeding behaviors were resolving. Both mother and infant seemed relaxed and attuned during the first feeding, the disattunement behaviors were exhibited during the second feeding as the infant

displayed greater proportions of fast, jerky, or rapid movements during feeding.

The number of changes in the mother's posture during the first observed feeding sessions was significant for dyad 18; but her changes were minimal. In the first feeding session the mother was slightly rigid, leaning slightly forward, with angular bends in elbows and fingers, and looking more intensely at her infant during feeding, she was relaxed during the second feeding. This posture in the first observation may have been a reaction to the presence of the investigator and the camcorder at the first videotaping session. Since relaxed and relaxed but slightly more rigid postures are associated with harmonic attunement these changes in this mother's posture were inconsequential to this dyad's interactive behaviors between the two feedings. The differences in the mother's postural changes are shown in Table 12.

Table 12

Differences in Mother Posture Between Two Feeding Sessions for Subject 18

Mother Posture	Proportion of feeding	
	1st	2nd
Limp	-	-
Relaxed	-	1.00
Relaxed with slightly rigidity	1.00	-
Tense	-	-
Upright/walking	-	-

Note. Statistical differences between each set of feeding sessions are χ^2, $p < 0.001$ The proportions of a feeding session may not equal 1.0 because proportions were adjusted to the nearest $1/100^{th}$.

In summary, the statistical reliability, or the stability of similar mother and infant behaviors occurring between two feeding sessions is inconclusive. Although statistical

differences were shown for eight comparisons, this statistical testing was compromised in favor of making Type I errors. The major code mother touch, in which differences occurred between feeding observations for three mothers, showed the greatest instability. However, it is not known which of the calculated differences were differences or clinical variances.

Validity. Validity of the coding guide is the extent to which the major behavior codes were true representations of mother-infant interaction during breastfeeding. Inductively identifying behaviors from videotaped breastfeeding sessions contributes to validity (Morse & Bottorff, 1990). Although Gross and Conrad (1991) suggest that use of videotapes may adversely effect validity because subtle behaviors can be missed on this two dimensional format, it is argued that because videotapes can be reviewed repeatedly by many observers, they facilitate identification and verification of behaviors. Yet that the presence of a camcorder and an investigator admittedly may influence a mother's behaviors during breastfeeding and the extent of this effect is not known.

Sampling Method

In this exploratory study the examination of mother-infant interaction during breastfeeding was based on the videotaped observations made when mothers entered the study. Two breastfeeding sessions were videotaped; the second was within 72 hours of the first, to ensure that all behaviors of interest were captured for each mother-infant dyad. In the initial study phase the investigator repeatedly viewed videotapes of all breastfeeding sessions. These observations contributed to the development of the ethogram. Empirical observations at this time indicated that the mother and infant behaviors were similar during both breastfeeding sessions and that this was validated by

the analytically comparing the paired-observations of the three mother-infant dyads. These findings are reported in the section on statistical reliability previously discussed in this chapter.

For the second study phase, that was comprised of re-examining the videotapes to code and to analyze the behaviors, it was decided that only the second videotaped observations of the breastfeeding sessions for the 24 mother-infant dyads would be used. This decision was based on four reasons. First, two breastfeeding sessions were videotaped when mothers entered the study to ensure all behaviors exhibited by mothers and infants during feeding were captured. A review of the tapes indicated that all behaviors were present in the group of tapes for sessions one and two. Second, initial observations of the videotapes revealed that behaviors during both breastfeeding sessions were relatively similar for each dyad. This was supported by statistical comparisons of 33 behaviors (11 per dyad) indicating there could be eight differences although as previously discussed these differences must be interpreted with caution. Mother touch was dissimilar between feeding sessions for three dyads, but mother posture, infant posture, infant movement, and infant touch were dissimilar once for three different dyads. Hence, mother touch seems to be the least stable behavior over time and this behavior was not included in the interaction patterns. For the dyad whose interaction pattern was different between the sessions, the mother had reported that although her infant had been a difficult breastfeeder his behavior was changing and the breastfeeding sessions were gradually improving. In the session in which the mother and infant were in harmonic attunement for the entire feeding session (see Table11) the infant was more relaxed and his movements were smooth whereas, in the second feeding when the

partners were in harmonic attunement for .82 of the proportion of the feeding session, the infant's movements were at times fast and jerky.

The third reason for using the videotapes from the second session was that mothers were more familiar with the investigator and the camcorder equipment and this possibly decreased the reactive effect on the mother. The fourth reason was based on the realization that the time and resources required for coding all videotapes would be substantial. This was confirmed as it took two research assistants10 months working part-time to code 27 breastfeeding observation videotapes.

The focus of this observational study was the interaction behaviors of the mothers and infants not the characteristics of mother-infant dyads. Throughout a breastfeeding session, the combinations of co-occurring behaviors defined as types of attunement were coded to 1/30th of a second and converted to the nearest number of seconds for analysis. For examining mother-infant interactions the unit of analysis was the one-second intervals in which types of attunement occurred. Of the 24,790 seconds of interactions analyzed in this study, two-thirds (16,467 seconds) represented either harmonic or disharmonic attunement and one-third (8,323 seconds), disattunement.

Methods of Analysis

For each videotaped breastfeeding session, the coded data in the ASCII file generated by the Coder2 software program was further analyzed. Using SAS software the data that had been coded to 1/30th of a second was converted to the nearest second, the unit of analysis used. The co-occurring events that comprised harmonic and disharmonic attunement and disattunement were combined to determine the time durations for each.

Since breastfeeding sessions were all different in time, the duration proportions (Booth & Mitchell, 1988), or the proportion of the feeding session, were calculated for each of the events (behaviors). Similarly, the combined events that represented harmonic and disharmonic attunement and disattunement were calculated. This procedure enabled statistical comparisons between the two breastfeeding groups.

Hypotheses were tested for the significance of breastfeeding group differences. To test the differences between duration proportions of the types of attunements and disattunement interactions and the duration proportion when an infant was off the breast, a 2-tailed test of differences in proportions (Snedecor & Cochran, 1980) was used. A similar 1-tailed test of difference in proportions was used to examine duration proportions when infants were in the enface position. Differences between the two breastfeeding groups on the NCAFS, EITQ, and EPDS scores were tested using t tests. The major behavior codes and each breastfeeding group were compared and statistical differences described using chi square tests. Differences between groups were accepted if the significance level was less than 5 % ($p < .05$) for all tests.

Means, standard deviations, and ranges were used to describe biographical characteristics. For examining group differences, the chi square test was used for categorical data and continuous variables were examined using t-tests and Mann-Whitney tests; however, violations of normality were not evident, and only the results of the t-tests are reported in the results. Finally, content analyses summarized the mothers' notations regarding breastfeeding advice. These data as well as appropriate investigator anecdotal notes and assessments are reported as descriptive narrations.

Ethical Considerations

The University of Alberta, Faculty of Nursing Ethics Review Committee and the University of British Columbia Behavioral Sciences Screening Committee for Research and Other Studies Involving Human Subjects reviewed this study to ensure that each university's ethical requirements for protecting human rights were met. The University of Alberta review was necessary to meet the doctoral dissertation requirements, the University of British Columbia (UBC) review was essential because the study was conducted in British Columbia with secondary supervision from a UBC faculty member. The study was also reviewed for the recruitment of subjects by all agencies: B.C. Women's Hospital, Burnaby General Hospital, Lion's Gate Hospital, St. Paul's Hospital, the Vancouver Health Department, and the Vancouver Breastfeeding Centre.

A variety of health care professionals recruited mothers who met the study criteria, and permission was obtained for this investigator to contact the mother. If mothers were interested, the investigator made a home visit to explain the study, to obtain informed consent (see Appendix G), and to arrange a videotaping schedule. Mothers were assured that if they did not participate in the study or if they decided to withdraw at any time, their heath care services would not be compromised.

Videotapes and all data collection forms were identified by number and stored in locked file cabinets in the investigator's office. The consent forms and master list of addresses and telephone numbers, the only sources of participant's names, were kept in a separate locked cabinet. Access to all data was limited to the dissertation committee, research assistants, and the investigator.

Participants were assured that their names would not be used in any research report, publication, or conference presentation. However, if they provided a special signed consent, pictures and videotapes without any identifying names, could be included in some publications, shown at conferences, or used for professional educational purposes. Permission was also obtained to use the videotaped observations for data in future projects providing ethics approval is obtained from an ethical review committee at the time a subsequent study is conducted.

Summary

An exploratory-descriptive-comparative design was used to examine videotaped breastfeeding sessions to identify and describe types of mother-infant interactions. An ethological approach was utilized to inductively develop an observational coding guide and to generate study hypotheses based on the study observations. Twenty-four mother-infant dyads were recruited. For 12 dyads, mothers perceived their infants as problematic breastfeeders and these were matched with 12 dyads in which infants were perceived as nonproblematic breastfeeders. Data were collected by videotaping breastfeeding sessions in the participants' homes, using two digital Hi8 camcorders. Two feeding sessions were videotaped within 72 hours of each other when participants entered the study at 22 to 69 days post birth to capture the mother-infant interactive behaviors, and a third was videotaped when the infant was two months old to examine mother-infant interactions using the NCAFS. Mothers at this time completed self-report questionnaires on their perceptions of their infant's temperament and their own depressive state. Examination of the feeding observations revealed that for some mothers and infants, interactions during feedings were smooth and flowing, rhythmic

patterns while for others feeding sessions were disjointed. Some mothers and infants were rarely in the enface position during breastfeeding. Codes representing these behaviors comprised the observational coding guide.

Two research assistants who were blind to the breastfeeding groups coded events, with onset timing. The videotaped breastfeeding sessions were repeatedly reviewed in real time, slow motion, and frame-by-frame. A Coder2 software program that enables events to be coded directly from videotapes to the computer for analysis facilitated coding. The unit of analysis for examining the mother-infant interactions was the type of attunement measured in one-second intervals. As well, Cohen's Kappa coefficient and percentage agreement were the measures used to estimate inter- and intraobserver agreements. Statistical reliability for three mother-infant dyads was determined by comparing two breastfeeding sessions, videotaped within a 48 hour period.

The observational data were converted to duration probabilities to compare the two breastfeeding groups. T tests, chi square tests, and scatter plots were used to determine differences between groups and examine associations between variables. Means, standard deviations, and ranges were used to describe biographical characteristics. Mothers' notations and assessment data were reported as narrative descriptions.

For this study ethical requirements for protecting human rights were met for the University of Alberta and the University of British Columbia. Study participants, who were referred to the investigator by health professionals, were assured protection of their rights in all phases of the study.

Chapter 4: Results and Discussion

Overview

In this chapter the results of this study are reported and discussed. The results include a description of the sample; comparisons of the two breastfeeding groups on the NCAFS, EITQ, and EPDI assessment measures; description and comparisons of the two breastfeeding groups during breastfeeding in regard to interaction patterns identified as harmonic and disharmonic attunements and disattunement, mother and infant touch, the enface position and the major behaviors that were identified and coded. Each section of this chapter includes a discussion of the findings.

Description of the Sample

Twenty-four first time mothers, all Caucasian, English speaking, and having given birth to full term infants, participated in this study. All participants wanted to breastfeed their infants, and neither mothers nor infants had anomalies that interfered with breastfeeding. Twelve problematic breastfeeding dyads were matched with 12 non-problematic breastfeeding dyads. Although equal numbers of male and female infants were sought, only one female infant was identified as a problematic breastfeeder; thus, the study sample included two female and twenty-two male infants. Data sets that included and excluded the female infant dyads were analyzed. Significant differences were not found; therefore, findings are based on the 24 mother-infant dyads.

Comparisons Between Problematic and Nonproblematic Breastfeeding Groups

Data collected to describe characteristics specific to the sample and to compare the two groups included biographical information, perinatal factors, feeding factors, and support from family and friends. Descriptive statistics such as frequencies, means,

standard deviations, and ranges were computed to describe the sample. Comparisons between the two breastfeeding groups for the variables identified in the biographical information guide were made using chi square tests for categorical variables and t tests for continuous variables since violation of normality were not evident. The significance level selected for this study to determine group differences was $p < .05$.

Demographic variables. Key variables used for matching mother and infant dyads, reported in Table 13 were not statistically different for the two groups in regard to mother's age, years of education, infant's gestational age, birthweight, and age when the breastfeeding session was first videotape. Although mother's years of education were not different, the categories identifying type of education indicated differences ($p = .0481$). The nonproblematic group had the greatest number of mothers in the completed highschool, university, or graduate school categories whereas the problematic group had greater numbers in the post secondary and university completion categories.

Comparisons between the two groups were in family incomes that were based on estimates of gross family income in the previous year. Two families in each group earned less than $20,000 and three families in the problematic group versus four in the nonproblematic group earned more than $90,000. For the remaining families, incomes tended to be higher in the nonproblematic group in that incomes for six families in this group ranged between $50,000 and $90,000 whereas in the problematic group four family incomes were between $30,000 and $49,999, and three were in the $50,000 to $90,000 range.

Table 13

Group Comparisons for Maternal and Infant Matching Variables

	N	M	SD	Range	t value	df	p value
Maternal Characteristics							
Age (years)							
Problem grp	12	31.7	4.0	28-40	-0.38	22	.71
Nonproblem grp.	12	32.2	3.49	28-39			
Total	24	31.9	3.69	28-40			
Education (years)							
Problem grp.	12	16.1	1.16	14-18	-1.08	22	.30
Nonproblem grp.	12	17.3	3.85	11-25			
Total	24	16.7	2.85	11-25			
Infant Characteristics							
Gestation (weeks)							
Problem grp.	12	40.0	1.29	38.5-42	0.47	22	.64
Nonproblem grp.	12	39.8	0.83	38-41			
Total	24	39.9	1.07	38-42			
Birthweight (grams)							
Problem grp.	12	3542	389.1	2948-4196	-0.18	22	.86
Nonproblem grp.	12	3572	458.1	3005-4309			
Total	24	3557	415.9	2948-4309			
Age (days)on first video							
Problem grp.	12	40.7	15.44	23-69	-0.05	22	.96
Nonproblem grp.	12	41	14.80	22-65			
Total	24	40.83	15.12	22-69			

Perinatal factors and infant feeding during hospitalization. Perinatal factors were similar for both groups in regard to mothers' labors, types of deliveries, anesthetics used, mothers' and infants' intrapartum complications. The greatest differences were related to infant feeding: reports of initiation and progress of breastfeeding were significantly

different (p. = .0237). Two mothers in the problematic group as opposed to eight in the nonproblem group reported that the initiation and progression of breastfeeding went well. Additional accounts from five mothers in the problematic group are that breastfeeding was easy but became stressful at three weeks;

either the baby started fussing at three weeks or the mother started producing breastmilk in excessive amounts at three weeks. Although not significantly different (p. = .0752), reports of infant feeding problems while in hospital varied between the groups. Two mothers in the problematic breastfeeding group described difficulty with the infant's latch or suck whereas, in the nonproblematic breastfeeding group, five mothers reported that their infants were sleepy, one described that her infant cried, and one said that her infant was fed by dropper. All problematic infants were exclusively breastfed in hospital where only eight out of 12 in the nonproblematic group were breastfed exclusively (p. = .0907). Among those in the latter group, one infant was initially fed formula or expressed breastmilk by dropper, and three breastfed infants had occasional formula supplementation. Reasons for supplementing the infants were not provided by the mothers.

Professional support. Professional support was similar for both groups. A physician or midwife provided the greatest emotional support followed by a lactation consultant or community health nurse. Although a lactation consultant or physician was cited as most helpful with breastfeeding, a physician and a hospital nurse were cited as least helpful. Husbands were reported to be more helpful with breastfeeding than professionals, particularly in the nonproblem group.

Family Support. All mothers described their husbands/significant others as supportive, and 10 mothers in each group indicated their significant others were their greatest help. Next to husbands/significant others, mothers/parents, and female friends and neighbors were most helpful to mothers. One mother in the nonproblematic group received no help from anyone. Only one husband in the nonproblematic group did not support breastfeeding. Those named as least supportive of breastfeeding included mothers, female friends, a physician and a hospital nurse.

These findings are similar to those in the research literature: in numerous studies, breastfeeding mothers designate their husbands/significant others as the greatest breastfeeding support (Albers, 1981; Baranowski et al., 1983; Beske & Garvis, 1982; Dusdieker et al., 1985; Hewat & Ellis, 1984; Houston et al., 1983; Matich & Sims, 1992). Next to significant others female friends and family members, health professionals provide the most support. Mothers in the problematic breastfeeding group tended to view health professionals as more helpful than friends. This could be a result of their need for more professional help with breastfeeding because of the problems they encountered.

Breastfeeding assessments. Breastfeeding assessments were made at each visit. The criteria for study participation for the mother-infant dyads in the problematic breastfeeding group was the presence of the mothers' perceptions of their infants as problematic breastfeeders because they detached frequently, choked, gagged, or fussed at the breast. Yet, the mothers in the problematic group all had a common concern by the third week postdelivery: they all tended to produce large quantities of breastmilk and many had active, forceful letdown reactions. At the two month visit, four mothers and infants were coping well with the feedings, and the other eight mothers had found

strategies that assisted them to manage during breastfeeding even though the problem had not resolved. Of these eight, the infants did not latch well throughout a feeding session, and seepage of breastmilk around the infants' mouths was often observed on the videotapes because the infants' mouths were not well connected to their mothers' breasts. One mother with an infant that latched poorly had chronically sore nipples. She found that a soft plastic nipple shield provided just enough comfort to continue breastfeeding. Mothers in the problematic group had obtained or were in the process of receiving professional help from a lactation consultant.

Descriptions of the infants' feeding patterns were vague. Most mothers reported that they fed their infants frequently, at least every two to three hours, but they could not be specific about the number of times a day the infant was fed, the length of time a feeding took, or that any consistent feeding pattern had been established.

At the second home visit, the investigator weighed and measured the infants and plotted their measurements on a graph. Assessments showed that the infants in both of the breastfeeding groups had no anomalies that would have compromised breastfeeding, and they were growing and developing satisfactorily.

Findings and Discussion of Study Hypotheses

In this section the hypotheses are restated and the findings for each are reported for mother-infant interactions: NCAFS assessment, mothers' perceptions of their infants' temperaments, maternal postpartum depression, mother-infant interaction: types of attunement, detachment from the breast during feeding, mother and infant touch during breastfeeding, and enface position during breastfeeding. Discussion of the findings is included in each section.

Mother-Infant Interaction: NCAFS Assessment

When the infants were two months of age, breastfeeding sessions were videotaped to examine mother-infant interactions using the NCAFS (Barnard, 1978; Sumner & Spietz, 1994). This scale assesses the following mother and infant interactive qualities: maternal components include sensitivity to the infant's cues, response to the infant's distress, and abilities to foster the infant's social/emotional and cognitive growth; infant components include the clarity of the mother's responsiveness. Clinical observations made by the investigator are that mothers with infants who detach frequently from the breast during breastfeeding were sensitive to their infants' cues and responded immediately to their distress, and the infant's provided clear cues and were responsive to their mothers' care. Therefore, it was postulated that the scores on the NCAF scale would not be lower; that is, they would not show less positive interactive behaviors for the problematic breastfeeding group when compared to the nonproblematic group. This observation was the basis of Hypothesis 1.

Hypothesis 1. Mother-infant dyads whose infants are perceived as problematic breastfeeders will not have significantly lower scores on the Nursing Child Assessment Feeding Scale (NCAFS) than mother-infant dyads whose infants are perceived as nonproblematic breastfeeders. This hypothesis is supported by the findings and reported in Table 14.

For the two breastfeeding groups significant differences between mothers' and infants' interactive behaviors described on the NCAFS were not detected. The NCAFS is a global assessment measure that includes 76 items pertaining to behaviors that indicate a positive mother-infant interactive system for facilitating positive relationships between the

Table 14

Comparison of Mother-Infant Interaction NCAF Scores Between Problematic and Nonproblematic Breastfeeding Groups (n = 12 dyads per group)

Subscale Items	M	SD	t value	df	p value
Mother					
Sensitivity to cues					
Problem group	14.1	1.9	-1.2	22	0.24
Nonproblem group	15.0	1.8			
Response to distress					
Problem group	9.9	1.6	-1.36	22	0.19
Nonproblem group	10.6	0.7			
Social-emotional growth fostering					
Problem group	10.3	2.6	-1.04	22	0.31
Nonproblem group	11.3	1.7			
Cognitive growth fostering					
Problem group	5.9	2.4	-0.92	22	0.37
Nonproblem group	6.7	1.6			
Mother total					
Problem group	40.3	7.6	-1.31	22	0.21
Nonproblem group	43.5	4.1			
Infant					
Clarity of cues					
Problem group	11.9	1.7	0.2	22	0.84
Nonproblem group	11.8	2.3			
Responsiveness to mother					
Problem group	5.9	2.9	-0.76	22	0.46
Nonproblem group	6.7	1.8			
Infant total					
Problem group	17.8	4.1	-0.36	22	0.72
Nonproblem group	18.4	3.8			
Mother/Infant total					
Problem group	58.5	11.2	-0.91	22	0.37
Nonproblem group	61.9	6.6			

Note. The higher the score the more positive the interaction behavior.

mother and infant and fostering social, emotional, and cognitive development of the infant during the first year of life. The lack of differences between the two groups on this interaction assessment scale suggest that the harmonic and disharmonic attunement and disattunement interaction patterns assess a different dimension of mother-infant interaction during breastfeeding.

An important characteristic of the mother-infant interactive system is that the "responses of the partners need to be contingent on one another" (Barnard et al., 1989, p. 43). On the NCAFS, 18 of 76 items, 15 for the mother and 3 for the infant, are scored as contingency behaviors. Differences between the two breastfeeding groups for the contingency scores were determined using t tests when group scores were sufficient in size. When numbers of items representing contingency were small, such as in maternal social-emotional, maternal cognitive growth fostering, infant responsiveness, and infant total score, a chi square statistic was used to determine differences. No items in the clarity of cues category have been identified as contingent; therefore, this aspect was not included. There were no significant differences between the two breastfeeding groups for the contingency items on the NCAFS suggesting that mothers and infants in both groups were similar in their contingent responses. However, the mean score of the problematic group mothers' contingent responses to distress was considerably lower than the score of the nonproblematic group mothers. This is particularly interesting because mean scores for the mothers' response to distress were similar for both groups when the response was not a contingent activity. Perhaps mothers whose infants are frequently distressed during breastfeeding gradually become less contingently responsive to their infants' behaviors. Findings are reported in Table 15.

Table 15

Comparison of Mother-Infant Interaction NCAFS Contingency Scores Between Problematic and Nonproblematic Breastfeeding Groups (n = 12 dyads per group)

Contingency Items	M	SD	t value	df	p value
Mother					
Sensitivity to cues					
Problem group	4.6	1.3	-1.44	22	0.16
Nonproblem group	5.3	1.2			
Response to distress					
Problem group	4.8	1.9	-1.46	14	0.17
Nonproblem group	5.6	0.7			
Mother total					
Problem group	11.3	3.2	-1.2	22	0.24
Nonproblem group	12.7	2.1			
Mother/Infant total					
Problem group	12.3	4.8	-0.96	16	0.35
Nonproblem group	13.8	2.4			

Contingency Items	chi square	df	p value
Mother			
Social-emotional growth fostering	0.17	1	0.68
Cognitive growth fostering	0.29	2	0.87
Infant			
Responsiveness to mother	1.07	2	0.59
Infant total	1.07	2	0.59

Note. The higher the score the more positive the contingency behavior.

Responding contingently to the infant has been identified by Lewis and Coates (1980) as more important than the amount of stimulation a parent provides in regard to a child's later cognitive abilities; as well it has been associated with a child's secure

attachment to the parent at one year of age (Ainsworth et al., 1978; Belsky & Isabella, 1988). Except for the mothers' response to distress, it is encouraging that the contingent behaviors of the mothers and infants in the problematic breastfeeding group were encouragingly similar to those in the nonproblematic group although the finding should be interpreted with caution because of the small sample size.

The NCAFS scores for this study sample were compared to NCAFS normative population data. The NCAFS data scores used were for Caucasian mothers and infants of all ages of infants during the first year of life (n = 933). Significant differences between each of the breastfeeding groups and the normative data of the NCAFS are reported in Table 16. These findings should be interpreted with caution because of the small group numbers for this sample and the fact that the infants in this study were two months of age.

Although the mothers' total scores showed no significant differences, the mothers' scores in the nonproblematic group were significantly higher than the NCAFS data for sensitivity to cues and response to distress. For the problematic group, mothers' social-emotional growth fostering behaviors were significantly lower. Examples of reports representing this category are the "caregiver's facial expression changes at least twice during feeding;" the "caregiver engages in social forms of interaction (e.g. games) at least once during the feeding;" the "caregiver uses positive statements in talking to the child during the feeding;" the "caregiver praises child or some quality of the child's behavior during the feeding;" and the "caregiver is in enface position for more than half of the feeding." Lower scores for the mothers in the problematic group indicate that these mothers were most likely focused on assisting their infant with the feeding process rather than engaging in social and emotional growth fostering activities during breastfeeding.

Table 16

Comparison of Mother-Infant Interaction NCAFS Scores Between Normative Population Data and Problematic and Nonproblematic Breastfeeding Groups

	NCAFS[a] n = 933		Problem group n = 12		Nonprob. group n = 12		Problem vs. NCAFS	Nonprob. vs. NCAFS
	M	SD	M	SD	M	SD	p value	p value
Mother								
Sensitivity to cues	13.7	1.9	14.1	1.9	15.0	1.8	ns	0.030
Response to distress	10.0	1.4	9.9	1.6	10.6	0.7	ns	0.013
Social-emotional growth fostering	12.1	1.9	10.3	2.6	11.3	1.7	0.035	ns
Cognitive growth fostering	7.0	1.9	5.9	2.4	6.7	1.6	ns	ns
Mother total	42.7	5.3	40.3	7.6	43.5	4.1	ns	ns
Infant								
Clarity of cues	12.8	1.9	11.9	1.7	11.8	2.3	0.095	ns
Response to mother	7.9	2.0	5.9	2.9	6.7	1.8	ns	ns
Infant total	20.8	3.4	17.8	4.1	18.4	3.8	0.028	0.051
Mother/Infant total	63.5	7.7	58.5	11.2	61.9	6.6	ns	ns

Note. The higher the score the more positive the interaction behavior.
[a]NCAST data is for Caucasion mothers and infants 1 to 12 months of age.

The infants' total scores were significantly lower than the normative data scores of the NCAFS for both breastfeeding groups. This may be indicative of the infants' age of two months. All NCAFS scores, and particularly those of infants, progressively increase during the first six months of life (Sumner & Spietz, 1994).

In this study differences in interaction tempos during breastfeeding were observed and identified as harmonic or disharmonic attunements or disattunement within both the

problematic and nonproblematic breastfeeding groups. Lack of significant differences between the two groups using the NCAFS is evidence that the scale assesses different dimensions of interactive behaviors. The NCAFS is more comprehensive and addresses **specific behaviors** for facilitating positive interactions and fostering social-emotional and cognitive development of the infant. Observations of attunement or disattunement represent the **tempo of the interactive behaviors** during breastfeeding sessions. Reassuringly, no differences in NCAFS scores were found between the two groups, although significant differences were evident between the two breastfeeding groups in regard to the pace and type of interactive behaviors observed during breastfeeding sessions.

Mothers' Perceptions of Their Infants' Temperaments

To describe the mothers' perceptions of their infants' temperament, the Early Infant Temperament Questionnaire ((EITQ) (Medoff-Cooper et al., 1993) was administered when infants were two months old. Hypothesis 2 was based on the assumption that mothers did not associate difficult feeding sessions with their infants' temperaments.

Hypothesis 2. Mothers whose infants are perceived as problematic breastfeeders will not rate their infants' temperaments on the Early Infancy Temperament Questionnaire (EITQ) significantly different than will mothers whose infants are perceived as nonproblematic breastfeeders. This hypothesis is supported by the findings reported in Table 17 and the comparison of this study sample to a normative population shown in Table 18.

Analysis of mothers' ratings of 76 items addressing their infants' behaviors on a five point scale provides a temperament profile of the infant that consists of nine temperament traits. The two groups were statistically similar to each other, and a comparison of the temperament trait scores for both groups with the normative population scores (see Table 18), indicate that all infants in this study were similar to the those that are classified by their mothers as "average" infants (Medoff-Cooper et al., 1993).

Table 17

Comparison of EITQ Scores Between Problematic and Nonproblematic Breastfeeding Groups (n=12 dyads per group)

Temperament Trait	Problem Group		Nonprob. Grp.		t value	df	p value
	M	SD	M	SD			
Activity	4.1	0.7	3.8	0.8	0.94	22	0.36
Rhythmicity	3.6	0.9	3.6	1.0	0.19	22	0.85
Approach	2.9	0.8	2.2	1.0	1.77	22	0.09
Adaptability	2.6	0.9	2.5	0.5	0.40	22	0.70
Intensity	3.8	0.9	3.9	1.0	-0.22	22	0.83
Mood	3.6	0.8	3.2	0.7	1.34	22	0.19
Persistence	2.7	0.8	2.7	0.8	0.12	22	0.90
Distract	2.3	0.8	2.3	0.4	0.05	22	0.96
Threshold	4,3	0.9	3.8	0.9	1.35	22	0.19

Further examination of the findings denote that the only score showing a possibility of a trend in differences between the two breastfeeding groups is the temperament trait described as approach ($p = .09$). This trait identifies the nature of the infant's initial response as approach or withdrawal to new situations or to stimuli such as

new foods, toys, persons, or situations (Chess, 1990). A mean comparison of the groups to the normative population indicates that the infants of the nonproblematic group were less approachable or more inclined to withdraw from new situations than were the problematic group who had slightly greater approachability scores than the normative population group.

Table 18

Comparison of Problematic and Nonproblematic Breastfeeding Groups EITQ Scores to EITQ Normative Population Scores

	Normative Scores			Problem Group (n = 12)	Nonprob. Group (n = 12)
Temperament Trait	+1 SD	M	-1 SD	M	M
Activity	4.23	3.58	2.92	4.1	3.8
Rhythmicity	3.92	3.12	2.36	3.6	3.6
Approach	3.2	2.58	1.94	2.9	2.2
Adaptability	3.16	2.49	1.81	2.6	2.5
Intensity	4.55	3.86	3.16	3.8	3.9
Mood	3.94	3.21	2.48	3.6	3.2
Persistence	3.50	2.79	2.07	2.7	2.7
Distractibility	3.25	2.65	2.04	2.3	2.3
Threshold	4.72	4.15	3.57	4.3	3.8

Note. EITQ normative scores are for 1-2 month olds, standardized on 404 infant in one pediatric practice, 218 males and 186 females (Medoff-Cooper et al., 1993).

Previous infant temperament questionnaires constructed by Carey and McDevitt (1978) for older infants, such as, the Revised Infant Temperament Questionnaire (RITQ) grouped temperament traits into three temperament constellations, classifying infants as having an "easy," "difficult," or "slow to warm-up" temperament. These classifications

were not determined for the EITQ but mothers in this study were asked for their general impression of whether their infants are easier than average, about average, or more difficult than average. Subjective impressions by mothers (or caregivers) are recognized as important by some researchers (Bates & Bayles, 1984; Hubert et al., 1982; Mebert, 1991) because parents' perception of the infant's behaviors influences interactions between them on a day to day basis. Mothers' views of their infants' temperaments are tallied as follows: four problematic group mothers and five nonproblematic group mothers said their infants were "easier than average;" four problematic group mothers and six nonproblematic group mothers said "about average;" and three problematic group mothers and no nonproblematic group mothers said "more difficult." Statistically, no differences showed between the groups (χ^2 (2, $\underline{N}$ = 24) = 3.51, $\underline{p}$ = .173) but because of the small numbers, this finding is interpreted with caution. The expected numbers in each cell are small, therefore, use of the chi square test is questionable. Two mothers did not respond to this question, indicating that they had no idea what an "average" infant was like and therefore had no reference for comparing their infant. Several other mothers in both groups expressed the same concern and failed to fully complete the questionnaire asking mothers to compare their infant to an infant of the same age in regard to the nine temperament traits. Mothers indicated that they found this section of the questionnaire too difficult because of their lack of knowledge about other infants' behaviors.

Content analysis of open-ended questions about their infants' temperaments and about problems regarding their baby's temperament were answered similarly by both groups. Infant fussiness was the greatest concern, and positive infant behaviors described by mothers were "easy going," "happy," "relaxed," and "likes people" and these were

similar for both groups. Findings suggest that mothers' perceptions of their infants' temperament were similar for the two breastfeeding groups. The difficulties with feeding encountered by those in the problematic group were not associated with their perceptions of their infants' temperaments.

Maternal Postpartum Depression

Barton (1991) identified that 30 % of the mothers (n = 100) attending a breastfeeding clinic had elevated scores on the Edinburgh Postnatal Depression Scale (EPDS) and that the breastfeeding concerns included difficulty with infant latch, infant pulling away from the breast during feeding, and the infant's frequency of milk regurgitation. Based on these findings hypothesis 3 was formulated.

Hypothesis 3. Mothers whose infants are perceived as problematic breastfeeders will have significantly higher scores on the EPDS than will mothers whose infants are perceived as nonproblematic breastfeeders. This hypothesis is supported by the findings reported in Table 19.

Examination of individual scores revealed that in the nonproblematic group six mothers' scores, ranging between 1 and 3 were exceptionally low, two mothers' scores of 10 were in the mild depression range, and one mother's score of 15 indicated depression. Scores in the problematic group were considerably higher, the lowest score was 7, five mothers' scores of 10 to 11 showed mild depression, and scores for three mothers implied postpartum depression, although two of these mother's scores were 12 and the third was 16.

Table 19

Comparison of EPDS Scores Between Problematic and Nonproblematic Breastfeeding Groups (n = 12 dyads per group)

Group	M	SD	t value	df	p value
Problematic	9.8	2.5	2.91	22	.009
Nonproblematic	5.5	4.4			

Note. The higher the score the more the greater the mother's depressive state. Scores on the EPDS range from a low of 0 to a high of 30. Cox et al. (1987) suggests that a score of 12 indicates postpartum depression and that scores ranging between 9 and 11 denote a milder type of depression.

Understandably, feelings of depression were more prevalent in the problematic group. Sleep deprivation was common among these mothers whose infants often exhibited irritable behaviors and fed frequently, 24 hours each day. The constant caregiving required and the concern that some mothers had about their infants' difficult feeding patterns seemed to contribute to the mothers' feelings of depression.

Recently, researchers have started focusing on the infant's contribution to maternal feelings of depression in the postpartum period. Gotlib (1989) found that difficult behavior in two month old infants is associated with maternal depression. Murray, Stanley, et al., (1996) report that neonatal irritability and poor motor functioning defined as hypo- or hyperactivity, are significant predictors of postnatal depression. Many infants in the problematic group were irritable and demonstrated active, uncoordinated motor behaviors. The differences in the depression scores for the two breastfeeding groups in this study could be a reflection of the infants' behaviors in the problematic group although

study findings also show that depression is associated with maternal perceptions of caregiving abilities.

Mild postpartum depression at one and three months postpartum was related to less positive feelings of maternal adequacy and style of caregiving in a study by Fleming et al. (1988). The mothers in their study responded to their infants' physical needs and provided adequate care, but interactions with their infants were less affectionate and vocalizations were fewer than those of mothers who were not depressed. When the infants were 16 months, differences in these indices were not found between the mildly depressive and nondepressive mother groups. However, significantly more mothers from the mildly depressive group had weaned their infants to milk substitutes at three months postpartum. We can assume then that mothers with "difficult" infants would question their caregiving abilities and that feelings of inadequacy are another contributor to their depressive state.

Recently, study findings indicate that postpartum "blues" and depression may have a biological connection (Magiakou et al., 1996). In a study monitoring levels of corticotropin-releasing hormone (CRH) among 17 women during the last trimester of pregnancy and throughout the first year following childbirth, findings revealed that for the women whose levels of CRH were the lowest, six developed postpartum "blues" and one was diagnosed as having postpartum depression. Investigators explain that during pregnancy, the placenta produces excessive CRH, a hormone that triggers the release of additional hormones including cortisol. Following the birth of the placenta, the prepregnant mechanism that stimulates the hypothalamus to release CRH is not optimally

functioning in some women and their CRH levels become low, contributing to feelings of depression in the postpartum period.

Cramer (1993) views postpartum depression as a "relational disturbance," suggesting that birth and the many psychological responsibilities incurred by an infant precipitates a disorder affecting parenting and mother-infant interactions resulting in conflictual mother-infant relationships and maternal depression. In clinical practice, Cramer found that when therapy was directed towards the mother-infant relationship rather than the depressive disorder, the depression resolved relatively quickly.

Findings in many studies indicate that when mothers are depressed it has negative effects on the infant, mother-child interactions, and the developing mother-infant relationship (Beck, 1995a, 1996; Field, 1992; Field et al., 1985; Karl, 1991). However, the focus of these studies (Beck, 1995a; Field; Murray, 1992) has been directed towards mother-infant dyads in which the mother is clinically depressed. Findings from these studies should not be assumed as applying to all types of maternal depressions in the postpartum period or all mothers' situations. Murray, Fiori-Cowley, et al. (1996) showed that the effect on the infant was greater within the context of social adversity. The study by Fleming et al. (1988) of mildly depressed mothers indicated that mother-infant interactions were compromised but effects on the relationship were not evident at 16 months. Cramer (1993) suggests that depression resolves quickly when mothers are treated for relationship conflicts. Further investigations are needed which centre on women who are mildly depressed during the postpartum period as well as the factors contributing to their depression, the long term effects on the infant, mother-infant interactions, and the developing mother-child relationship. A greater understanding of

this phenomenon will assist health professionals to identify and support women who, like many in the problematic group in this current study, indicate mild depressive feelings.

Mother- Infant Interaction: Types of Attunement

Harmonic attunement, disharmonic attunement, and disattunement were identified as interaction patterns that occurred during breastfeeding sessions. As described in Chapter 3, harmonic attunement is defined as mother-infant interaction behaviors that are coordinated and smooth in nature; disharmonic attunement is defined as mother-infant interaction behaviors that are active and tense in nature; and disattunement *is* defined as the interaction behaviors of the mother and infant that are concurrently dissimilar in tension and activity. Duration proportions for each of these interaction patterns during breastfeeding sessions were expected to be different for the two breastfeeding groups. A duration proportion is the number of seconds that an event (or behavior) occurred, divided by the total number of seconds in the observation (Booth & Mitchell, 1988). Hypotheses 4, 5, and 6 address the differences.

Hypothesis 4. Mother-infant dyads whose infants are perceived as problematic breastfeeders will interact in harmonic attunement for less time than will mother-infant dyads whose infants are not perceived as problematic breastfeeders. This hypothesis is supported by the finding that the duration proportion of harmonic attunement during breastfeeding sessions was .19 for the problematic group versus .73 for the nonproblematic group ($p < .0001$).

Hypothesis 5. Mother-infant dyads whose infants are perceived as problematic breastfeeders will interact in disharmonic attunement for longer time periods than will mother-infant dyads whose infants are not perceived as

problematic breastfeeders. This hypothesis is supported by the finding that the duration proportion of disharmonic attunement during breastfeeding sessions was .42 for the problematic group versus.0 7 for the nonproblematic group ($p < .0001$).

Hypothesis 6. Mother-infant dyads whose infants are perceived as problematic breastfeeders will exhibit longer periods of disattunement than will mother-infant dyads whose infants are not perceived as problematic breastfeeders. This hypothesis is supported by the finding in that the duration proportion of disattunement during breastfeeding sessions was .33 for the problematic group versus .21 for the nonproblematic group ($p < 0.0376$). The results of testing the three hypotheses are reported in Table 20 and illustrated in Figure 3.

The rhythmic qualities of mother-infant interaction during breastfeeding have been examined in this study. Those in which the partners were coordinated and dancing smoothly to the same melodic tune were identified as harmonic attunement. In these interactions the mothers and infants are relaxed or minimally tense, mothers show sensitivity to their infants, infants respond positively, and both partners interact in a smooth, coordinated manner. This type of interaction is restful, pleasant, and satisfying for the mother and infant and contributes to the development of a positive mother-infant relationship. The proportion of the breastfeeding sessions that the nonproblematic group was harmonically attuned was .73 which was significantly greater than .19 for the problematic group.

For the problematic breastfeeding group the greatest proportion of the breastfeeding sessions was in disharmonic attunement followed by disattunement. Proportions of each of these types of interactions were .49 and .33 respectively.

Table 20

Comparison of the Duration Proportions of Attunements and Disattunement During Breastfeeding for Problematic and Nonproblematic Breastfeeding Groups (n = 12 per group)

Behavior	Proportion of Feeding		p value
	Group		
	Problem	Nonproblem	
Harmonic Attunement	.19	.73	< 0.0001
Disharmonic Attunement	.49	.07	< 0.0001
Disattunement	.33	.21	0.0376

Notes. (1) The p value is based on 2-tailed tests of difference in proportions (Snedecor & Cochran, 1980). (2) The proportions for each group do not equal 1.0 because proportions were adjusted to the nearest 1/100th. (3) The proportions for each of the two breastfeeding groups are considered to be conservative because two infants in the problematic group were not identified as difficult breastfeeders by the investigator and this was supported by the analysis in that these dyads were in harmonic attunement for 95% and 85% of their feeding sessions. Their mothers reported that their infants had been difficult breastfeeders and that their feeding behaviors during videotaping sessions were unexpectedly calm and not disruptive. While talking to her infant during feeding, one mother stated, "this is the best feeding that you have ever had." Both mothers reported continued improvements in breastfeeding behaviors at the two month visit.

During the disharmonically attuned interactions, a mother was sensitive to her infant who was active or tense and who at times would suddenly detach from the breast during feeding. As the mother responded to her infant's activity and changing behaviors, the quality of the interaction became lively, tense, and slightly out of step as the mother continually modified her behavior in response to those of her infant. When this type of

interaction occurred for a large proportion of a breastfeeding session, mothers showed signs of stress.

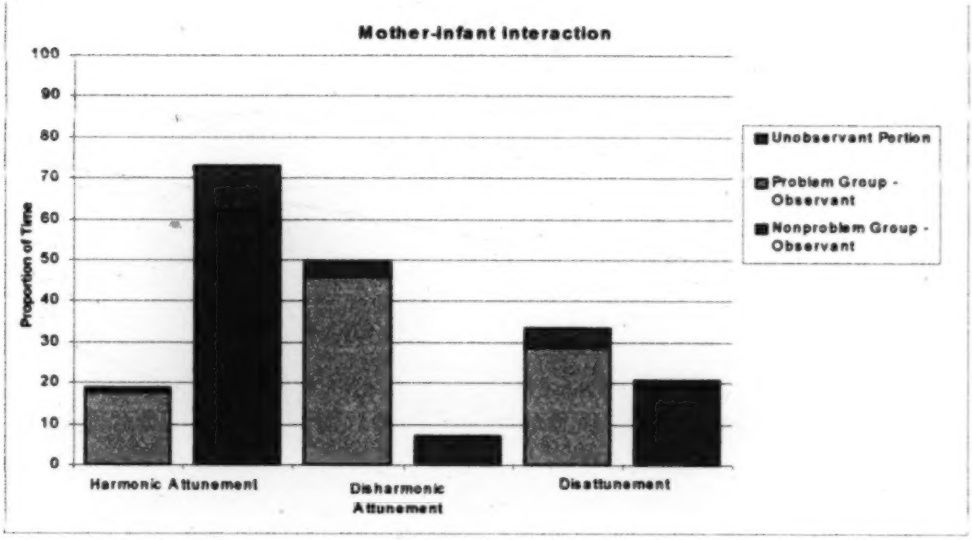

Figure 3. Duration proportion of attunements and disattunement during breastfeeding for problematic and nonproblematic breastfeeding groups (n = 12 per group).

Interactions that were disattuned occurred when a mother and infant demonstrated opposite behaviors in regard to posture (relaxed versus tense) or movement (slow/coordinated versus active/uncoordinated), or when the mother's affect appeared negative during periods when the infant was relaxed and movements were slow and coordinated. These partners were dancing to tunes with different tempos; one was slow, and the other was fast or melancholy. Disattunement frequently occurs at the beginning of a feeding session when an infant is tense and the mother is relaxed but in most feeding sessions the infant's tension dissipates soon after feeding starts. This disattunement is

often repeated just before an infant detaches from the breast. For some partners, dancing different dances for great proportions of a feeding period was common.

Definitions of the three interaction constellations measuring duration proportions of attunements and disattunement focus on how much mother and infant *primarily* look towards each other. A mother and infant who look towards one another are defined as *observant* while partners who look away from one another are defined as *unobservant*. Positions that permit mothers and infants to look towards each other provide opportunities for them to visually interact. Although intentional social gazing on the part of the infant may not be well developed in early infancy, availability of mother's face for visual contact in the first weeks of life is meaningful for facilitating mutual visual gaze. Cycles of visual attention and withdrawal are important components of the interaction process, withdrawal by the infant occurs when a stimulus becomes intense (Brazelton et al., 1974). The unobservant proportions during the attunements and disattunement phases account for short periods of withdrawal when they do occur. The observant and unobservant proportions of the attunements and disattunement constellations for the two breastfeeding groups are reported in Table 21 and illustrated in Figure 3.

Examination of the observant and unobservant proportions of the findings show that the mothers and infants in both groups spend the greatest proportion of a feeding session looking towards each other. Interestingly, the mothers in the problematic group were particularly watchful of their infants. This may characterize their apprehension that the infant could detach from the breast at any moment.

Table 21

Duration Proportions of Observant and Unobservant Periods During Attunements and Disattunement During Breastfeeding for Problematic and Nonproblematic Breastfeeding Groups (n = 12 dyads per group).

Interaction Pattern	Problematic Group	Nonproblematic Group
Harmonic attunement		
Observant	.18	.62
Unobservant	.01	.11
Disharmonic attunement		
Observant	.46	.07
Unobservant	.03	< .01
Disattunement		
Observant	.31	.18
Unobservant	.04	.02
Total proportion of feeding		
Observant	.93	.88
Unobservant	.08	.13

Note. The proportions of a feeding session may not equal 1.0 because proportions were adjusted to the nearest 1/100th.

Characteristics of positive interactions have been identified by Barnard (1978) as a mother who is sensitive and responsive to her infant's behavioral cues and an infant who provides clear cues and is responsive to her/his mother's caregiving and soothing activities, and social dialogue. Brazelton et al. (1974) describe critical components in maintaining interactions as the mother's ability to be sensitive to her infant's capacity for attention and the need for the infant to periodically withdraw from her attention. When

this process of mutual attention and withdrawal occurs, mother-infant interactions have a rhythmic quality.

Spietz (1978) eloquently describes reciprocal interactions between mother and infant, stating their relationship

> is one in which the mother and infant interact within a system where each has the ability to affect each other and where each adapts his/her behavior to that of the other. A positive interaction in this sense, may best be described as one having rhythmical quality with each member of the interaction being flexible, sensitive, and sympathetic to the needs of the other. When the balance is not equalized, or a member is out of tune, the interaction takes on a negative quality. (p. 8)

Mothers and infants in this study interacted within the interaction framework described by Spietz (1978). For the most part the mothers were sensitive and responsive to their infants' behaviors, and the infants gave clear and consistent cues, responding positively to their mothers' caregiving and soothing activities. The interaction behaviors were particularly evident when infants were active, tense, or frequently detached from the breast. Differences in the rhythmic quality and tempo of the interactions are the findings addressed in this study.

Rhythmic tempo is an additional dimension for observing mother-infant interactions within the context of breastfeeding. Interactions described as harmonic and disharmonic attunements and disattunement are constellations of mother and infant behaviors that have differing rhythmic qualities and tempos. As previously described, when mothers and infants are harmonically attuned, the tempo and rhythm of their interaction is slow, coordinated, and smooth; when they are disharmonically attuned, the

tempo and rhythm is fast, uncoordinated, and disjointed like a tune quite out of synchronization with itself. Mothers and infants who are disattuned are individually dancing at different tempos; consequently, the interaction is devoid of a mutual rhythmic quality.

The three types of interactions described may be observed during a breastfeeding session. Harmonic attunement is the ideal and should be evident for the largest proportion of a feeding. Concerns arise when the durations of disharmonic attunement and/or disattunement are extended throughout most of a feeding session. When disharmonic attunement was observed for long periods during feeding sessions, the constant activity, fast tempo, and the syncopated interactional rhythm of mother and infant were observed as frustrating to the mother. In addition, when these kinds of feeding sessions reoccurred eight to 10 times a day for several weeks, mothers reported that they were exhausted. Since the infant is part of a reciprocal interactive system, she or he would also feel the effects. Although the interactions of these partners fit the framework described by Spietz (1978), the tempo and duration of these interactions could have a negative effect on the mother and infant and their developing relationship.

Extended periods of disattunement during feeding sessions are also of concern, and in these sessions the behaviors of each partner require further examination. When a mother is relaxed and the infant is active or tense, can the mother be maintaining her relaxed countenance to conserve her energy or to attempt a calming effect on her infant? Does her slower tempo, even though the rhythms between the mother and infant are out of tune have a positive or negative effect on an active, tense infant? These questions were not part of this study but should be explored.

In this study, disattunement was also used to designate an interaction between a mother and infant when the mother displayed a negative affect such as a sad face or a look of intolerance. This type of disattunement is of a different nature: the mother and infant may or may not be dancing to the same rhythm and tempo but the mother appeared not to be enjoying the dance; hence she was not an optimal dancing partner. The disattunement cconstellation should be examined in greater depth to determine and differentiate the types of interactive patterns of disattunement in mother and infant partners.

Detachment from the Breast During Breastfeeding Sessions

A criterion for the problematic group to participate in this study was that the mother viewed her infant as a disruptive breastfeeder, meaning that the infant detached frequently from the breast or choked, coughed, or fussed, during breastfeeding sessions. Mothers were observed as spending a greater proportion of a feeding session consoling or assisting their infants to relatch on the breast than did mothers of infants who were nonproblematic breastfeeders. To verify this assumption, hypothesis 7 was tested.

Hypothesis 7. Infants perceived as problematic breastfeeders will detach for longer proportions of the feeding sessions than mother-infant dyads whose infants are not perceived as problematic breastfeeders. This hypothesis is supported by the findings reported in Figure 4.

The differences in the proportion of a breastfeeding session that an infant was off the breast were .22 for the problematic breastfeeders and .06 for the nonproblematic breastfeeders. Using a 2-tailed test of difference in proportions (Snedecor & Cochran, 1980) the proportions were found to be significantly different ($p = .0006$). These findings are illustrated in Figure 4.

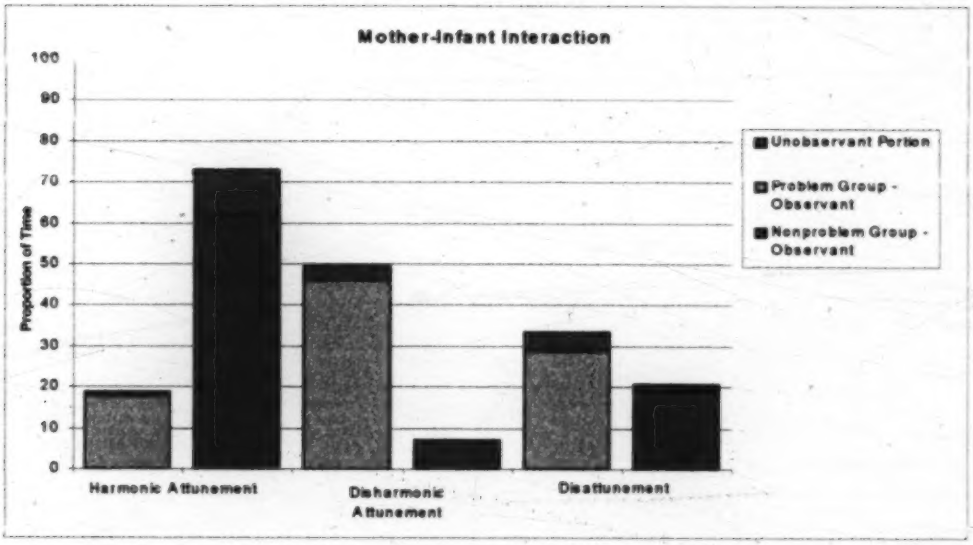

Figure 4. Comparison of duration proportions during breastfeeding that infants were on, off and positioned at the breast between problematic and nonproblematic breastfeeders.

Findings also show that the proportion of a breastfeeding session that infants were feeding on the breast or being positioned on the breast was .78 for the problematic group and .94 for the nonproblematic group. The mean feeding time for a breastfeeding session for the problematic group was slightly shorter, 977 seconds compared to 1090 seconds for the nonproblematic group even though they spent less time on the breast (see Appendix I).

Frequencies of the number of detachments infants had from the breast during feeding sessions was determined. The mean number of times that infants in the problematic group detached was 8 (the range was 1 to 24) as opposed to 2.3 times (the range was 0 to 7) in the nonproblematic group.

These findings are further evidence that mothers in the problematic group had more active feeding periods in that they spent more time during breastfeeding sessions comforting, "burping," or assisting their infants to reattach to the breast to resume feeding. Because these infants were off the breast for longer periods during feeding, we can assume their mothers had more opportunities to interact with them more in the face to face position. However, when infants in the problematic group were detached, the infants were often positioned on their mothers' shoulders to be "burped" or placed face down on the mothers' knees or arms. In these cases mothers rubbed their infants' backs, trying to soothe and console the infant, but mothers did not interact with their infants face to face.

Mother and Infant Touch During Breastfeeding

Observations of the breastfeeding sessions indicated that mothers and infants exhibited different kinds of touch during breastfeeding sessions. In periods that were relaxed and calm, mothers often gently patted or stroked their infant, and the infant would at times reach out and gently touch her or his mother with fingers or a hand. During the more lively, active breastfeeding periods, the mother's touch consisted of firm rubs and pats and caregiving touches. Maternal touch events were coded when a mother intentionally touched her infant for purposes of soothing, stimulating, or caregiving. The touch of the mother's arm or hand used for holding the infant during feeding was not coded but all touches of the "free" hand or fingers and any stroking or patting by the fingers of the "holding" hand were recorded. Periods when mothers were not touching their infant other than for holding the infant at the breast were coded as no touch. Touches were categorized as non-moving when mothers rested their hands on the infant's body or limb, gentle pats or strokes, firm pats, firm rubbing strokes and caregiving

touches (defined as wiping the infant's mouth or restraining a flailing arm). To analyze differences in mother touch between the two breastfeeding groups, types of mother touch were aggregated into minor codes of non-moving and gentle touches, and firm pats and rubbing touches. Hypothesis 8 addresses types of mother touch between the two breastfeeding groups.

Hypothesis 8. Types of mother touch will be different when the infant is perceived as a problematic breastfeeder than when the infant is perceived as a nonproblematic breastfeeder. This hypothesis is supported by the findings that are reported in Table 21 and illustrated in Figure 5.

Table 22

Comparison of Duration Proportions of Types of Mother Touch During Breastfeeding Between Problematic and Nonproblematic Breastfeeding Groups (n = 12 per group)

	Proportion of Feeding				
Mother Touch	Problem grp.	Nonprob. grp.	chi square	df	p value
No touch	.49	.21	30.4	3	< 0.001
Non-moving/gentle	.31	.69			
Firm pat or rub	.11	.04			
Caregiving	.09	.05			

Note. The proportions of a feeding session may not equal 1.0 because proportions were adjusted to the nearest 1/100th.

Findings revealed that the proportion of breastfeeding sessions when mothers did not touch their infants was more than twice as great for the problematic breastfeeding

group (.49 versus .21) and that infants in the nonproblematic group were gently patted, stroked, or had their mothers' free hand resting on them for more than twice the proportion of the feeding session than infants in the problematic group (.69 versus .31). The greater proportion of the breastfeeding sessions that mothers in the problematic group spent firmly patting, rubbing, or wiping their infants' faces is reflective of the increased time that these infants were detached from the breast, often consoling a distressed infant during a feeding session.

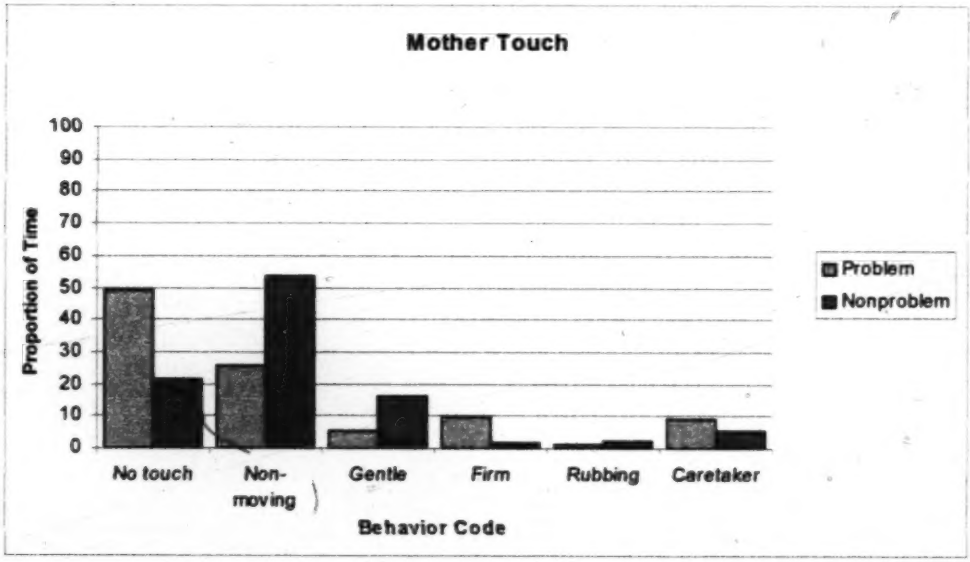

Figure 5. Proportion of type of mother touch during breastfeeding between problematic and nonproblematic breastfeeding groups.

Previous studies examining mother touch during feeding are limited. In a study of breastfeeding infants within the first two days after birth, Alberts et al. (1983) report findings similar to a study of bottle feeding infants by Kay and Wells (1980). In both

studies mothers jiggled and patted their infants more frequently during pause cycles of the infants' suck-pause feeding pattern, prolonging the pause phase. When infants were tactilely stimulated during the sucking phase, the period of sucking time decreased. Investigators view this tactile stimulus and response as a beginning conversation. In the current study, mother touch was not coded during suck-pause phases because the sucks and pauses were not clearly discernible on the videotapes. However, observations did not reveal that mothers touched their infants in accordance with their suck-pause cycles. Maternal touches were more consistent with the rhythmic tone of the feeding. During periods that were calm and relaxed, as in harmonic attunement, mothers gently patted and stroked or rested their hand or fingers on their infant. Whether the mother's touch assisted in calming the infant to feed at a slower tempo or whether the disposition of these partners waltzing together elicited the gently affectionate touches is not known, but it is speculated that this activity enhances positive interactions.

Maternal touching during feeding has been shown to be important to the developing mother-child relationship during the first year of life. In a study reported by Dunn (1977), breastfeeding mothers touched their infants significantly more than did bottle feeding mothers during feeding sessions in the first 10 days of life and this finding was repeated during observations when the infants were seven months of age although significant differences were not found when the infant was one year. Similar findings for breast and bottle feeding mothers but during play sessions when infants were between three and 12 months of age are described by Kuzela et al. (1990) who suggest that touching during feeding transposes to other mother-child activities. Thus, types of maternal touching during the early weeks of breastfeeding: that is, gentle touching verses

more aggressive touching, could have implications for the developing mother-child relationship and should be investigated further. Assessments of type of touch when infants are problematic breastfeeders and concomitant interventions should be investigated.

Types of touches that the infant directs towards the mother during breastfeeding are not reported in the literature. From viewing the videotapes, it was observed that infants' tactile contacts with their mothers were observed to be different for the two breastfeeding groups, generating hypothesis 9.

Hypothesis 9. Types of infant touch will be different when the infant is perceived as a problematic breastfeeder than when the infant is perceived as a nonproblematic breastfeeder. This hypothesis is supported by the findings and reported in Table 22 and illustrated in Figure 6.

Table 23

Comparison of Duration Proportions of Types of Infant Touch During Breastfeeding Between Problematic and Nonproblematic Breastfeeding Groups (n = 12 per group)

	Proportion of Feeding				
Infant Touch	Problem grp.	Nonprob. grp.	chi square	df	p value
No touch	.43	.46	14.9	4	0.005
Non-moving	.31	.43			
Gentle	.05	.06			
Firm	.12	.03			
Random	.10	.01			

Note. The proportions of a feeding session may not equal 1.0 because proportions were adjusted to the nearest 1/100th

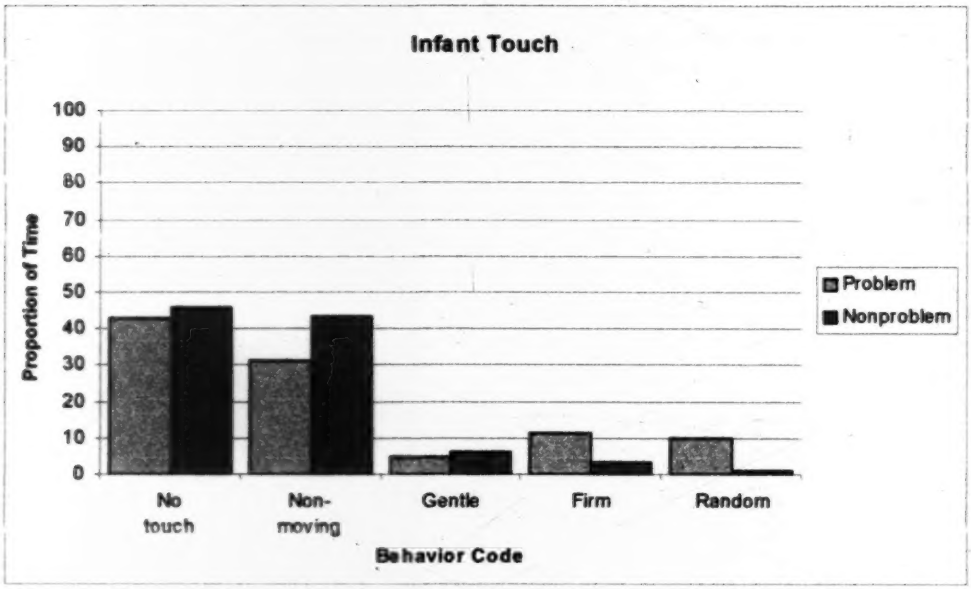

Figure 6. Proportion of infant touch during breastfeeding between problematic and nonproblematic breastfeeding group.

In this study infant touch was defined as tactile contacts that the infant made towards the mother with fingers, hands, arms, feet, or legs. Tactile contacts, necessary for breastfeeding such as the infant's mouth on the mother's breast and nipple, and the close proximity of their bodies in the feeding positions were not coded. Findings indicate that infants in the nonproblematic group made non-moving contact with a hand, fingers,.

foot, or leg with their mother for a greater proportion of the feeding period than did the problematic group (.43 versus .31). For a greater proportion of the feeding sessions the infants in the problematic group touched their mothers more firmly, for example, with swipes from the hands and arm and kicks from the feet and legs, or with

random touches made by flailing arms and legs (.22 versus .4 when firm and random touches are aggregated). The more aggressive touches are a result of an infant's increased activity and uncoordinated movements during feeding sessions when on and off the breast, and are not regarded as intentional by the infant. A few mothers responded by gently restraining their infants' moving limbs (included in maternal caregiving touches). How a mother feels about this active poking touch during feeding as opposed to an infant's hand or fingers resting on her breast, hand, or arm was not explored in this study. Further investigation of the effect this behavior during feeding may have on mothers is warranted.

Enface Position During Breastfeeding

Researchers investigating mother-infant interaction suggest that the enface position during feeding sessions is important for enhancing mother-infant interactions (Kennell, 1974; Barnard & Eyres, 1978). An item on the NCAFS indicates that mothers and infants should be in the enface position for at least 50% of a feeding session. Yet, observations of the breastfeeding sessions for both groups revealed that this position was rare between mothers and infants during breastfeeding and led to the formulation of hypothesis 10.

Hypothesis 10. Infants will spend less than 50 percent of the feeding session in the enface position. This hypothesis is supported by the study findings and illustrated in Figure 7.

The average percent of time all infants were in the enface position during breastfeeding was 2.5 %. Using a 1-tailed test of a binomial proportion (Snedecor & Cochran, 1980) this percentage was shown to be statistically less than 50 % ($p < .001$). In the interaction

literature the enface position is considered important for facilitating direct eye to eye contact (Given, 1978; Robson, 1967) which in turn evokes social interactions and positive maternal feelings (Brazelton et al., 1974; Rheingold, 1961; Spitz & Wolff, 1946; Stern, 1974; Watson, 1965). Use of the enface position is positively associated with a mother's affectionate touch, gentle caregiving, kissing, cuddling, and smiling (Givens, 1978). Observations of feeding sessions videotaped for the NCAST study (Barnard, 1978) reveal that mothers of infants who were one and four months of age positioned their infants to maximize periods of mutual gaze during bottle and breastfeeding and teaching sessions. For these reasons, use of the enface position for at least 50% of an infant feeding session was included in the NCAF scale as a positive maternal interactive behavior (Sumner & Spietz, 1994).

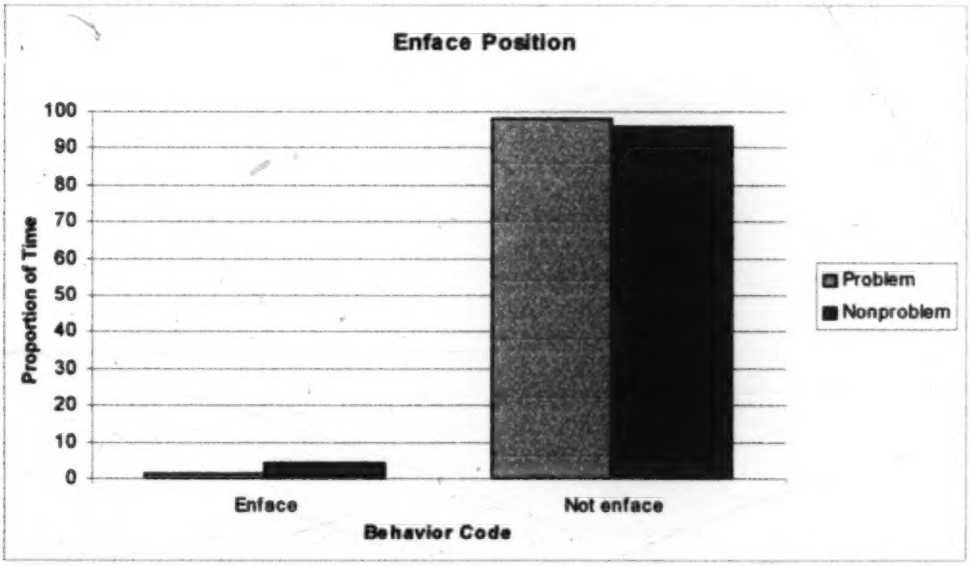

Figure 7. Proportion of the enface position during breastfeeding between problematic and nonproblematic breastfeeding groups..

Yet, findings in this study are evidence that when infants within the first two months of life are breastfed the enface position is difficult to attain and may be inappropriate. Reasons for this conclusion include the incongruence between a position that facilitates ease of breastfeeding in the first two months and the enface position; the infant's consuming intent on feeding during a breastfeeding session; the age of the infant in regard to contributing to visual social interactions; and the appropriateness of the context of breastfeeding as the most opportune time for eliciting visual interactions.

The positions for breastfeeding that all but two mothers assumed were the modified cradle or cradle hold. In these positions as well as the lying down position, the infant faces the mother directly and is held close against her so that a successful latch on the breast can be achieved and the young infant is assisted in staying on the breast during feeding. The infant's face looks directly at the mother's breast and the eyes are at an angle that is 45 to 90 degrees different than the mother's eyes. If the infant turns her or his head, she or he has more difficulty sucking and swallowing. If the mother tries to align her eyes in the same plane as the infant's eyes, she finds that the position of her head and neck is uncomfortable to hold even for a few seconds. In addition, contact is possible only with the infant's upper eye. Attaining the enface position during breast feeding is almost impossible when the cradle, modified-cradle, or lying down positions are used.

The football hold, an alternative breastfeeding position, is thought to be more appropriate for attaining the enface position. The infant is held close to the mother's breast, she or he is more upright and it is possible for mother and infant to achieve the enface position. However, for the two mothers in this study who used the football hold,

the proportion of their breastfeeding sessions in the enface position were .01 and .00, respectively.

During clinical observations of young infants breastfeeding, this investigator is constantly amazed at the infants' concentration on the feeding process. Distracting a young infant who is hungry or who is sucking and feeding well is difficult to do. Additionally, when an infant has difficulty feeding, mothers do not want to interfere with this important activity. When mutual gaze interactions with young infants are observed during breastfeeding, they are observed to occur towards the end of the feeding session when the infant is becoming satiated. In observations of mother-infant gaze during bottle feedings, Stern (1974) noted that gaze patterns between the mother and infant were different during feeding than during play episodes. During feeding, the mother's gaze was not accompanied by speech or facial expressions as was the case during play sessions when the responsivity of the infant was also changed. Stern contributes this to the infant's different physiological state while sucking. Infants' physical growth is rapid during the first two months of life. A basic physiological need for young infants to concentrate on the feeding process is understandable; they must resist distractions during the breastfeeding period.

Researchers studying mother-infant face to face interactions suggest that reciprocal social interactions start at approximately two to three months and peak at six months. In numerous studies, infants were three months of age when investigations started (Cohn & Tronick, 1987; D'odorico & Levorato 1990; Field, 1977; Fogel, Toda, & Kawai, 1988; Stern, 1974; Tronick et al., 1980). Perhaps the enface position during feeding is more critical when infants are three months of age because they are then

developmentally ready for intentional visual social interactions, their breastfeeding patterns are established, and they are physically larger and stronger, requiring less assistance to stay latched on the breast during feeding sessions.

In a study examining mother and infant dyadic interactions involving facial, vocal, and gaze behaviors of infants between three and four months of age, Stern (1974) chose play as the context for studying the interactions because "there is no other 'task' at hand except to interact" (p. 189). Interactions of play require a period of time when mother and infant are not distracted by other actions and can be engrossed in developing reciprocal social interactions. Perhaps the time when infants are breastfeeding in the early months is not the most appropriate time to expect the enface position to facilitate visual interactions. A more suitable expectation is for mothers to assume the enface position following breastfeeding and during other periods when her infant is alert.

Major Behavior Codes

Major behavior codes that contributed to the constellations of behaviors identifying harmonic attunement, disharmonic attunement, and disattunement were maternal look, posture, and affect, and infant look, posture, and movement, previously described in Chapter 3. Comparisons of the proportion of the breastfeeding sessions between the two breastfeeding groups for each of these individual behaviors is reported in Appendix H and illustrated in Figures 8 to 13 in Appendix I. Findings show no differences in regard to mother and infant look but all other behaviors were significantly different between the two groups. The infants in the problematic group were more tense and displayed more "jerky" or agitated movements than were those in the nonproblematic group. Whether these behaviors contribute to the disruptive behavior at the breast or are

a result of frequently detaching from the breast is not known. They are infant behaviors that can alert a practitioner to further assess a mother's and infant's interaction patterns during breastfeeding.

Mothers' breastfeeding postures are tense for significantly longer proportions of the breastfeeding sessions in the problematic group than in the nonproblematic group. Mothers in the former group are often responding to a tense, perhaps active infant who may suddenly come off the breast, and her tension is understandable. The individual behavior that is of greatest concern here is mothers' affect. During the proportion of .47 of the problematic group's breastfeeding session compared to .09 of the nonproblematic group's breastfeeding sessions, mothers were identified as looking "sad." In contrast, the nonproblematic mothers displayed a positive affect for the proportion of .90 of their breastfeeding sessions, compared to the proportion of .35 of the time of the problematic mothers. A negative affect portrayed by the mother has been linked with influencing the infant's expressivity.

Infants of mothers who display a negative affect in face to face interactions have been shown to have more negative expressions (Cohn et al., 1990; Cohn & Tronick, 1983; Field, 1992; Pickens & Field, 1993). Tronick et al. (1986) suggest that an infant's sad, negative expression is not just mirroring the mother's affect but is a response that develops when the infant who tries to elicit a positive response from the mother fails and subsequently withdraws, feeling ineffectiveness about the self. The infant eventually associates positive feelings with sadness and withdrawal and these feelings and behaviors are internalized and influence her or his interactive behavior. Thus the social exchanges between a mother and infant, even in the early weeks are reciprocal and could have far

reaching effects if they continue for months. As recommended in the discussion about disattunement and mothers' negative expressions, noticing a mother's "sad" face during breastfeeding warrants exploration and intervention to engage the infant in positive interactions.

Summary

Findings in this study confirm that there are differences in mother-infant interactions during breastfeeding when the infant frequently displays disruptive behaviors such as an on-off pattern, choking, coughing, or fussing at the breast during the feeding period. The duration proportions of breastfeeding sessions that were identified as harmonic attunement, disharmonic attunement, and disattunement were significantly different for the two breastfeeding groups. These interaction patterns are constellations of mother-infant behaviors that differ in rhythmic qualities and in tempos. Greater proportions of mother-infant interactions during breastfeeding in the problematic group were disharmonically attuned and disattuned whereas a greater proportion of the nonproblematic group feeding sessions were harmonically attuned.

Additional significant differences between the groups during breastfeeding sessions were that infants in the problematic groups spent longer periods off the breast, and they tended to touch their mothers more firmly or randomly with flailing arms or legs. Mothers in this group touched their infants less during feeding and demonstrated fewer non-moving or gentle touches. All mothers and infants also spent 2.5% of the feeding sessions in the enface position which is significantly less than the recommended time of 50%. Breastfeeding positions assisting young infants to latch and stay on the breast during feeding do not facilitate the mother and infant to assume an enface position.

Differences between the two breastfeeding groups in mother-infant interactions assessed by the NCAFS were not statistically significant. In contrast, significant differences did exist between the two groups in regard to the tempo of the mother-infant interactions during breastfeeding. This difference in tempo suggests that patterns of attunement are a different dimension of mother-infant interaction. As well, mothers' perceptions of their infants' temperaments were not statistically different suggesting mothers in the problematic group did not associate infant temperament with the difficulties encountered with feeding.

The problematic group of mothers were significantly more depressed than were those in the nonproblem group. Recent research findings show associations between postpartum depression and difficult behavior in infants, neonatal irritability, poor neonatal motor functioning (hypo- or hyperactivity) and less positive feelings of maternal adequacy. Understandably, these factors could stimulate feelings of depression in the postpartum period for mothers in the problematic group. However, determining whether depression was antecedent to or an outcome of difficulties experienced during breastfeeding is not possible.

The major behavior code that was of greatest concern was mother affect: the proportion of the breastfeeding sessions in which mothers in the problematic group portrayed a sad face was .47 whereas the proportion of the breastfeeding sessions in which those in the nonproblematic group displayed a positive affect was .90. Maternal negativity has been shown to result in infants with more negative expressions and to negatively influence mother-infant interactions and social development of the infant.

Chapter 5: Summary, Conclusions, Limitations, Recommendations for Research, and Implications for Practice

Overview

In this chapter the overall study is summarized, conclusions are outlined, and additional discussion is presented. This is followed by a description of the limitations of the study and a presentation of the recommendations for future research and implications for practice.

Summary

In this exploratory study the intent was to examine and describe mother-infant interactions within the context of breastfeeding and to compare the interactions when infants were perceived as problematic or nonproblematic breastfeeders. Infant temperament and maternal depression were identified as factors that influence mother-infant interaction and the breastfeeding relationship; hence these factors were examined.

Observational research methods were used to explore, describe, and compare mother-infant interactions. Since in depth examination of the types and variances of mother-infant interactions during breastfeeding have not been undertaken, the ethological approach was utilized. This method starts with an inductive phase to examine a phenomenon, to identify behaviors of interest, and to generate hypotheses. This is followed by a deductive phase that tests the hypotheses.

Twenty-four Caucasian and English speaking first time mothers and their full term infants participated in the study. Twelve problematic breastfeeding dyads were matched with 12 nonproblematic breastfeeding dyads. Both groups were statistically similar for maternal age (M = 31.9 years, SD = 3.69), years of education (M = 16.7years, SD =

2.85), infants' gestational age (M = 39.9 weeks, SD = 1.07), infants' birthweights (M = 3557 grams, SD = 415.9), and age of the infant when first videotaped (M = 40.8 weeks, SD = 15.12). Family gross annual income in both groups ranged between < $20,000 to >$90,000. Mothers in the problematic group had identified that their infants frequently detached from the breast during breastfeeding, displaying an on-off pattern, choking, coughing, or fussing. Twenty-two infants were male and two were female.

Mothers and infants were videotaped during breastfeeding sessions in their homes, twice at the time of recruitment and once when the infant was two months old. The first two videotaped feeding sessions were reviewed, repeatedly, using real time, slow motion, and frame by frame techniques. An ethogram consisting of detailed descriptions of mother and infant interactive behaviors was developed. Differences in tempo and rhythm of the mother-infant interactions were noted. Constellations of mother and infant behaviors representing these patterns formed the basis of an observational coding guide. Interactive patterns were called harmonic attunement, disharmonic attunement, and disattunement. Videotapes of the feeding sessions were reexamined and two research assistants who were blind to each dyad's breastfeeding status coded the identified behaviors. A Coder2 software computer program facilitated the coding procedure.

Reliability of the use of the coding guide was estimated. Inter- and intraobserver agreements between the investigator and the two research assistants determined by Cohn's Kappa coefficient and percentage agreements were all exceptionally high, ranging from 0.80 to 1.0 for the Kappa statistic and .90 to 1.0 for the percentage agreement. Statistical reliability of the coding guide was estimated by comparing two feeding sessions

for each of three dyads. Of 33 behavior comparisons (11 per dyad), eight were statistically different. The behavior consistently showing instability over time was the mother's touch towards her infant during breastfeeding, but this was not a behavior that was included in the constellation of interactive behaviors. The remaining behaviors that were different could be due to chance or indicative of clinical realities.

Inductive identification of behaviors from the videotaped feeding sessions contributed to the validity of the coding guide. Since the behaviors of each dyad were considered to be similar, with the exception of touch behaviors, in each of the initial two videotaping sessions and since the time and resources are substantial in coding videotaped behaviors, the second videotaped breastfeeding session was coded for the group comparisons. The variability of mother and infant touch in breastfeeding interactions warrants further study.

Ten hypotheses, three identified *a priori* and seven generated from the inductive phase of the study, were tested (see Chapter 4). Findings reveal that mother-infant dyads in the nonproblematic group spent significantly greater proportions of their breastfeeding sessions in harmonic attunement (.73 versus .19 for the problematic group) whereas those in the problematic group spent greater periods disharmonically attuned (.49 versus .07 for the nonproblematic group) and disattuned (.33 versus .21 for the nonproblematic group). The tempo and rhythm of harmonically attuned interactions were slow, coordinated, and smooth as the partners waltzed to the same tune. Those of disharmonic attunement were lively and slightly uncoordinated as the partners danced to a syncopated rhythm. One partner, the mother, was slightly out of step as she modified her behaviors to

match those of the infant. In the disattuned interactive pattern the partners were each dancing to melodies that were different in tempo and in rhythmic quality.

As anticipated, infants in the problematic group spent greater proportions of the feeding sessions detached from the breast (.22 versus .06 for the nonproblematic group). The mean number of times they detached from the breast per feeding session was 8 as opposed to 2.3 for those considered nonproblematic breastfeeders, confirming that the infants in the problematic group had more disruptive feeding sessions.

The types of mother touch during breastfeeding were significantly different for the two groups. Those in the nonproblematic group touched their infants for longer periods during feeding and provided more gentle pats and strokes (.69 versus .31 for the problematic group) as their infants fed whereas mothers in the problem group tended to pat and rub their infants more firmly. Types of touches that infants directed towards their mothers were also significantly different. Nonproblematic group infants initiated non-moving contact with their mother; that is, they rested their hand or fingers on the mother's hand, arm, or breast for the proportion of .43 of the feeding sessions as opposed to .31 for the infants in the problematic group. These problematic group infants touched their mothers more forcefully for a proportion of .22 of the feeding sessions (versus .0 4 for the nonproblematic group) as their active arms and legs kicked or flailed, making contact with their mother.

The enface position is suggested in the interaction literature as an optimum position for holding infants during feeding was assumed by mothers and infants in this study for only 2.5 % of the breastfeeding sessions. This is significantly less than the recommended 50 % of a feeding session in the enface position (Barnard 1978; Sumner &

Spietz, 1994). Observations of mothers and infants breast and bottle feeding for the NCAST program showed mothers of one and four month old infants positioning them in the enface position for feeding, however, the mothers in this current study did not assume this position during breastfeeding. Observations of these breastfeeding sessions show that infants face the mother and look directly at her breast and her or his eyes are at an angle 45 to 90 degrees different than the mother's eyes. To attain the enface position during breastfeeding infants must turn their heads away from the breast to fully gaze at their mothers, and the mothers must position their heads so their eyes are parallel with those of the infants. This position can result in a young infant having difficulty sucking and swallowing and maintaining a proper latch on the breast and the mother holding her head and neck in a poorly aligned and uncomfortable position. For the infants in this study who were between one and two months of age, attaining the enface position for 50 % of a breastfeeding session would be difficult and inappropriate.

Mothers and infants were videotaped during breastfeeding sessions when their infants were two months of age to examine mother-infant interactions using the NCAFS. No differences were seen between the two groups on this more global assessment measure. Comparing the NCAFS scores of the two breastfeeding groups to normative population NCAFS scores, the mothers in the nonproblematic group were significantly more sensitive to infants' cues and to infants' distress, and the infants in the problematic group had significantly lower total scores indicating less clarity in cues they provided and in responsiveness to their mother. This latter difference could be related to the infants' age: those in this study were two months old and the normative population scores were average infant scores between one to 12 months of age. Infants' scores on the NCAFS

were reported as progressively increasing for the first six months of life, thus an average of their scores will be higher than they would be at two months of age.

The mothers' perceptions of their infants' temperaments for the nine temperament traits assessed by the EITQ were not different for the two groups and were similar to those of a normative population. The scores in both groups were within one standard deviation of the normative population scores for the nine temperament traits.

Scores on the EPDS for the mothers in the problematic group were significantly higher than scores for the nonproblematic group ($p = .0009$). Using Cox's (1987) interpretation guidelines, five mothers in the problematic group and two in the nonproblematic group could be mildly depressed and three mothers in the problematic group and one in the nonproblematic group would be classified having a postpartum depression. The rate of postpartum depression in the problematic group is estimated at 25 %, exceeding the incidence of 10 % to 15 % reported among childbearing women in the first six to eight weeks postdelivery (Carothers & Murray, 1990; Cox et al., 1993; O'Hara et al., 1990) and slightly lower than 30% of women who attended a breastfeeding clinic because of difficulties feeding their infant (Barton, 1991). Evidence of an association between postpartum depression and difficult behavior in infants is recently cited in the literature (Gotlib, 1989; Murray et al., 1996). Although this is congruent with the findings in this study, it is not possible to determine whether depression was antecedent to or an outcome of the breastfeeding difficulties experienced by the women in the problematic group.

The major individual behaviors coded were significantly different between the two groups with the exception of mother looks and infant looks. Maternal affect was of

greatest concern; for 47 % of the problematic group, the mothers displayed "sad" faces during feeding sessions compared to 9 % for the nonproblematic group. Findings from several studies indicate that infants whose mothers display a negative affect during face to face interactions show more negativity and depression and interact less positively during social interactions (Cohn et al., 1990; Field, 1984; Field, et al,1985; Fleming et al., 1988).

Conclusions

The findings from this study lead to the following eleven conclusions.

1. Mother-infant interactions during breastfeeding vary in tempo and rhythmic quality. Three interactive patterns identified were called harmonic attunement, disharmonic attunement, and disattunement. All patterns may be observed during a breastfeeding session; however, when mothers and infants are disharmonically attuned or disattuned for greater proportions of a feeding session, this suggests their breastfeeding experiences may not be as pleasant and may have a negative influence on a satisfying breastfeeding relationship.
2. Harmonic and disharmonic attunement interactive patterns, were associated with an infant's breastfeeding behaviors, were examined when infants breastfed well and when they frequently detached from the breast during feeding. The harmonically attuned interactive pattern, most restful and satisfying to both mother and infant, was evident for the greatest proportion of the breastfeeding sessions when infants breastfed well; the disharmonically attuned pattern, most active and tense for both mother and infant, was the primary interactive pattern when infants frequently detached from the breast.
3. Disattunement interactive patterns, occurring when mothers and infants were interacting at different tempos and rhythms, included two constellations of mother and

infant behaviors. One pattern occurred when an infant was active and tense and a mother was relatively relaxed and positive. Additional examination of this type of disattunement is warranted to explore the rationale for and the effect of this type of interactive pattern. For example, a mother may be consciously functioning with slow, coordinated movements and a positive demeanor to try and calm her infant. The second constellation of behaviors defined as disattunement occurred when a mother was disattuned because she displayed a negative affect such as a sad face. The reason for and the consequences of this type of disattunement may be different than the type previously described. Findings from studies provide evidence that this type of interaction has negative effects for infants and mothers. Types of disattunement warrant further study.

4. The interactive patterns identified in this study were generated from ethological observations of mothers and infants breastfeeding and are considered a different dimension of interaction than the interaction assessed by the NCAFS. In this study, significant differences in the interactive patterns between the two breastfeeding groups were found but mother-infant interactions were not significantly different for the type of interactions assessed by the NCAFS.
5. The harmonic attunement, disharmonic attunement, and disattunement interactive patterns identified in this study were examined within the context of breastfeeding for infants within the first two months of life. Further study is necessary to determine if these patterns are applicable to other age groups, to infants with other feeding difficulties, and/or of different circumstances, for example, during bottle feeding or caretaker-infant play situations.

6. The enface position is difficult for mothers to attain and inappropriate when breastfeeding young infants. Encouraging use of the enface position for facilitating eye to eye contact between mothers and infants at other periods, for example, following breastfeeding or during play periods would be more suitable during the first two months of life.
7. Mothers who consider their infants as difficult breastfeeders do not associate difficult infant temperament with their infants' breastfeeding behaviors. This conclusion is based on the outcomes of the EITQ and this interpretation should be regarded with caution because the sample size in this study was small.
8. Mothers who experience breastfeeding difficulties, such as her infant frequently detaching from the breast, are at greater risk for postpartum depressive disorders as indicated on the EPDS. This outcome also supports recent research findings that suggest an infant's behavior and/or a mother's negative feelings about her caretaking abilities may contribute to depression during the postpartum period.
9. A mother's touch towards the infant and the infant's touch towards the mother vary during breastfeeding. Further study of mother and infant touch during breastfeeding is warranted.
10. A higher incidence among male infants than female infants of the type of breastfeeding difficulty examined in this study is indicated, but this assumption requires further exploration. Equal numbers of male and female infants were sought for this study, but, of the 12 problematic dyads recruited, 11 of the infants were male.
11. An observational coding guide for identifying types of interaction patterns during breastfeeding was developed. The major maternal and infant behaviors included in the

guide are considered reliably stable between breastfeeding sessions when infants are three to eight weeks of age. The behaviors are valid within the context of breastfeeding because they were inductively generated. For the trained observers, use of the guide was reliable between observers and over time.

Discussion

The tempo and rhythm of the breastfeeding interaction that mothers and infants experience frequently, and daily, during the first two months of infants' lives is important to the developing mother-infant relationship. When the interactive behaviors of the partners are harmonically attuned for the majority of a breastfeeding session the mother and infant experience a pleasant and gratifying interaction. However, one speculates as to what effect frequent breastfeeding sessions have on mothers and infants when they are disharmonically attuned throughout the majority of a breastfeeding session. This type of a scenario may be represented by an infant who is active and detaches frequently from the breast and a mother who is also active and tense because she is keeping pace with her infant's behaviors as she responds to her or his needs. Frequent daily breastfeeding sessions of these faster paced interactive behaviors can become exhausting and frustrating to the mother and may foster irritability in the infant. Interactions such as this, many times a day, may also contribute to a more difficult adjustment to the mother role and for some decreased feelings of self esteem.

Breastfeeding interactions in which the mother and infant are dancing to different tempos and rhythms, or disattuned interaction, occurs when one partner appears more relaxed and exhibits slower, coordinated movements and the other is tense and active. When it occurs for the majority of a breastfeeding session it can be interpreted in three

ways. A mother may be intentionally trying to modify her infant's active behavior by using stroking movements that are slow and soothing to modify the active behavior of her partner in a positive way. Or, some mothers who experience this dissynchronous type of interaction during breastfeeding may question why they do not find breastfeeding totally pleasant and satisfying and wonder what they are doing wrong. Or, if disattunement occurs because one of the partners is unresponsive to the other, either the mother may possibly be depressed or the infant may be compromised in her or his capacity to breastfeed.

Differences were shown between the problematic and the nonproblematic breastfeeding groups in the tempo and rhythm of mothers' and infants' interactive behaviors during breastfeeding whereas the interaction assessed using the NCAFS showed no differences between the groups. These findings could have two meanings. First, the interactive pattern based on tempo and rhythm represents a different dimension of interaction than the type of interaction evaluated by the NCAFS. Second, the interactive constructs measured by the NCAFS (the sensitivity of the mother to her infant, her awareness of alleviating infant distress, her ability to provide growth fostering activities , and the infant's clarity of cues and responsiveness to the mother) are important interactive behaviors particularly during disruptive breastfeeding sessions. Likely mothers and infants who are attuned during breastfeeding, whether the attunement be harmonic or disharmonic, will have similar scores on the NCAFS.

For mothers and infants who are noticeably disattuned for prolonged periods during breastfeeding, the NCAFS could be a useful measure for differentiating between those who are trying to modify their infants' activity and a partnership in which the

mother or infant is unresponsive to the other. These mothers and infants are out of synchronization in both tempo and rhythm; they are reciprocal in their sensitivity to each other. Early identification of a discord leads to earlier assistance from professionals that might improve the relationship of the mother and infant.

During breastfeeding, mothers hold their young infants in a position that facilitates the infant to stay on the breast and to optimally suck and swallow. When a cradle or modified cradle hold is used an infant is positioned on its side, facing its mother. The infant's face and eyes look directly towards its mother's breast and only the infant's upper eye is visible to the mother; the second eye is below her breast. When the infant is in this position a mother cannot possible bring her eyes in parallel alignment with the infant's eyes. If an infant turns its head to look towards the mother's face, the infant may detach from the breast or pull away causing discomfort or damage to the mother's nipple. The only breastfeeding position that is congruent with enface positioning is the football hold, but very few mothers use this position regularly.

Observations of infants breastfeeding also reveal that infants in the first two months of life frequently close their eyes for a large proportion of a feeding session. When they are breastfeeding well, young infants are totally focused on the feeding activity and for them, eye-to-eye contact may be distracting. As previously mentioned, this type of social contact with a young infant is more appropriate following a breastfeeding session or during play periods.

Not surprisingly, the use of the enface position for 50 % of a feeding session is an interaction component of the NCAFS. These scales were developed when fewer women breastfed their infants. During bottlefeeding, infants held in a cradle position are held in a

more open position that facilitates eye-to-eye contact with their mothers. Likely, observers of bottlefed infants assumed the eye-to-eye contact an important component of breastfeeding interactions.

High degrees of motor activity, disruptions, and periods of irritability exhibited by some infants in this study during breastfeeding did not seem to cause mothers to view their infants as having difficult temperament. These infants then are not at risk for experiencing less attentive care from their mothers as reported in studies by Campbell (1979) and Medoff-Cooper and Schraeder (1982). Still the mothers' assessments of their infants' behaviors on the EITQ may be questions as to their accuracy. The mothers in the problematic breastfeeding group may have underestimated their infants' difficult behaviors: they may have assessed their infants' behaviors similar to those of an average infant, to enhance their feelings of self-esteem (Elliott et al., 1996).

The greater amount of tactile contact exhibited by the mothers who were more harmonically attuned with their infants during breastfeeding suggests that there may be a relationship between these variables. Likely the more relaxed demeanor of both partners and the slower interactive pace during periods of harmonic attunement are conducive to a mother periodically stroking, patting, or gently holding her infant's hand, arm, or leg during breastfeeding. Speculation suggests that these types of interactive behaviors during breastfeeding will positively contribute to a satisfying breastfeeding relationship.

A clinical observation made but not fully examined in this study was that the majority of the mothers in the problematic group had an active and at times forceful breastmilk letdown reflex and many had an overabundant milk supply. Likely, this phenomenon contributed to the infants' feeding difficulties, which then led to a more

disruptive type of breastfeeding interaction. Also interesting to note, of 12 infants who exhibited an on-off pattern at the breast, 11 were male infants and one was female. The ratio brings up these yet unanswered questions: Could there be an association between maternal oversupply or active letdown and infant gender? What is the percentage of male versus female infants who exhibit breastfeeding difficulties in the general population? These and questions can heighten curiosity and engender motivation to examine other aspects of the breastfeeding relationship.

In this study, two families in each breastfeeding group whose gross annual income was less than $20,000 per year; but the reason for this was that three fathers were attending college or university and one had recently become unemployed. Although incomes of some families were considered to be in a lower than average economic strata they were considered well educated and low risk families.

The conceptual framework of this study was based on two models. The Child Health Assessment Interaction Model (Barnard & Eyres, 1978; Sumner & Spietz, 1994) provided guidance for delineating the mother, infant, and environmental factors that may influence the mother-infant interaction during breastfeeding; the Barnard model provided a framework for a closer examination of the mother-infant interaction system within the context of the breastfeeding partnership. Both models guided the study and provided the focus for examination of this phenomenon.

Limitations of the Study

The limitations of this study are the following:

1. The participants in this study were self-selected Caucasian, English speaking mothers who were well educated and living with a significant other and their full term infants

who either breastfed well or who detached frequently from the breast during breastfeeding. Study findings should not be generalized beyond a similar population.

2. The sampling method--that is, the unit of analysis of one second intervals--generated a large sample for identifying the interactive patterns and for comparing the observed mother and infant behaviors but the sample for the group comparisons for the NCAFS, EITQ, and EPDS was small, and these findings should be interpreted with caution.
3. The interactive patterns and mother and infant behaviors during breastfeeding identified in this study are reliable and valid to the extent of the reliability and validity of the developed observational coding guide. Use of the coding guide by the observers was reliable as indicated by the inter- and intraobserver agreement outcomes.

Recommendations for Future Research

The recommendations for future research include studies that utilize the current database and new areas for study.

Studies Utilizing the Current Database

The videotaped observations of mothers and infants during breastfeeding are an abundant source of data for numerous future studies. The coded observational behaviors can be examined in greater depth and in new ways, and the videotaped observations are an excellent resource for secondary analyses. The mother and infant behaviors during breastfeeding coded for this study examined co-occurring constellations of behaviors to identify different interactive patterns. These coded behaviors can be used as a basis for several additional studies. A sequential analysis which examines behaviors transitional to

changing interactive patterns, would provide information about what triggers changes in the interactive patterns.

A sequential analysis of mother and infant touch behaviors should also be undertaken. Knowledge of this phenomenon during breastfeeding is limited. Study of the reciprocity, the interplay, and the rhythm of mother-infant touch during breastfeeding would contribute to a greater understanding of beginning communication patterns. The determination of a mother's type of touch in response to specific infant behaviors, or vice versa, and the consequences of the touch could both lead to developing interventions when infants are active or detach frequently for the breast.

A study should be initiated that examines the content and tone of mothers' vocalizations, the sounds made by infants during breastfeeding, and how these sounds may be associated with the identified interactive patterns.

Further study of the interaction pattern called disattunement is essential to specifically define types of disattunement. A study that includes mothers' descriptions about the rationale for their behaviors or their perceptions of interacting with their infant during breastfeeding would provide comprehensive findings regarding the interaction pattern called disattunement.

Additional Areas for Study

Studies that examine the rhythms, tempos, and interactive patterns in new populations or in different situations could be extensive. Examples of specific focuses are mother-infant dyads who have other breastfeeding difficulties such as when an infant is sleepy or fussy; in which the infants are older; dyads in which the infants are bottle feeding; mother-infant play periods; and dyads in which mothers question their ability to

produce sufficient milk. Essential to such studies is an in depth exploration of the changing nature of the tempo and rhythms of interactive patterns as the infant develops.

Implications for Practice

This study has implications for health professionals working with breastfeeding women and their infants. Findings should increase awareness among professionals of mother-infant interaction during breastfeeding. When the tempo of breastfeeding sessions are observed as primarily active and tense in nature a discussion about the frequency of the pattern and the mother's perceptions of the experience of breastfeeding should follow. Mothers who engage in this type of activity during breastfeeding, many times a day and for weeks, inevitably become exhausted. Recognizing the problem, listening to their concerns, assisting them to find feeding positions in which their infants are less tense during feeding, and providing positive feedback about their commitment to breastfeeding will encourage mothers to continue.

Breastfeeding sessions in which the tempo of the mother's and infant's behaviors are mainly dissimilar—such as when an infant is active and tense and the mother is relatively relaxed—should be addressed through discussion about the mother's perceptions of breastfeeding and her infant's behaviors at that time. The mother may be consciously trying to calm her infant so that she or he can more easily cope with the feeding process. Listening to this mother's descriptions of her infant's behaviors, exploring techniques that she has implemented to assist her infant breastfeed, and providing positive feedback will all contribute to her feelings of maternal caregiving competence. Such support from a professional will encourage mothers to continue breastfeeding when difficulties arise.

In breastfeeding sessions where the mother is active and tense but the infant is relatively relaxed and calm, exploration and discussion about the mother's breastfeeding activity is needed. Perhaps she is unaware of her behaviors, or perhaps she is anxious about the breastfeeding process. Encouraging her to talk about her breastfeeding experience and helping her to relax and enjoy breastfeeding will be beneficial.

When it is noted that a mother disengages from her infant during breastfeeding, further assessment is needed. The interaction of the mother and infant should be observed during other caretaking or play situations. If disengagement occurs only during breastfeeding, her perceptions about what breastfeeding means to her should be explored. Or, the disengagement could be an indication of depression, which requires more in-depth assessment and intervention.

Use of the enface position when breastfeeding young infants is almost impossible to attain and should not be a requisite of optimal caretaking during this period. However, professionals can alert parents to the importance of using the enface position to facilitate eye-to-eye contact and social interactions when the young infant is not feeding from the breast.

Evidence shows that mothers of infants who exhibit breastfeeding difficulties are at greater risk for postpartum depression; therefore, screening women who are experiencing difficulties breastfeeding their infant is recommended. Early recognition of depressive feelings would enable early interventions toward alleviating the problem and preventing negative or long lasting effects to the mother and child relationship.

In a publication recently released by the Canadian Institute of Child Health (1994), two critical areas pertinent to childbearing families that should be improved upon in

Canada were: preventing "low birth weight and providing opportunities for healthy attachment of mothers and babies" (p. 37). The present study, which is the focus of this paper, is relevant to fostering positive mother-infant interactions during breastfeeding that contribute to optimal mother-child relationships.

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Appendix A

Nursing Child assessment Feeding Scale
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Appendix B

Early Infancy Temperament Questionnaire (EITQ)
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Appendix C

Edinburgh Postnatal Depression Scale (EPDS)

EDINBURGH POSTNATAL DEPRESSION SCALE (EPDS)

J. L. Cox, J. M. Holden, R. Sagovsky
Department of Psychiatry, University of Edinburgh

Subject #_____

As you have recently had a baby, we would like to know how you are feeling. Please UNDERLINE the answer which comes closest to how you have felt IN THE PAST 7 DAYS, not just how you feel today.

Here is an example, already completed.

I have felt happy:

Yes, all the time
Yes, most of the time
No, not very often
No, not at all

This would mean: "I have felt happy most of the time" during the past week.
Please complete the other questions in the same way.

IN THE PAST 7 DAYS:

1. I have been able to laugh and see the funny side of things
   As much as I always could
   Not quite so much now
   Definitely not so much now
   Not at all

2. I have looked forward with enjoyment to things
   As much as I ever did
   Rather less than I used to
   Definitely less than I used to
   Hardly at all

3. I have blamed myself unnecessarily when things went wrong
   Yes, most of the time
   Yes, some of the time
   Not very often
   No, never

IN THE PAST 7 DAYS

4. I have been anxious or worried for no good reason
   - No, not at all
   - Hardly ever
   - Yes, sometimes
   - Yes, very often

5. I have felt scared or panicky for no very good reason
   - Yes, quite a lot
   - Yes, sometimes
   - No, not much
   - No, not at all

6. Things have been getting on top of me
   - Yes, most of the time I haven't been able to cope at all
   - Yes, sometimes I haven't been coping as well as usual
   - No, most of the time I have coped quite well
   - No, I have been coping as well as ever

7. I have been so unhappy that I have had difficulty sleeping
   - Yes, most of the time
   - Yes, sometimes
   - Not very often
   - No, not at all

8. I have felt sad or miserable
   - Yes, most of the time
   - Yes, quite often
   - Not very often
   - No, not at all

9. I have been so unhappy that I have been crying
   - Yes, most of the time
   - Yes quite often
   - Only occasionally
   - No, never

10. The thought of harming myself has occurred to me
    - Yes, quite often
    - Sometimes
    - Hardly ever
    - Never

Cox, J.L., Holden, J.M., & Sagovsky, R. (1987). Detection of Postnatal Depression. British Journal of Psychiatry, 150, 782-786.

Appendix D

Biographical Information Guide

Mother-Infant Interaction During Breastfeeding

BIOGRAPHICAL INFORMATION GUIDE

Subject #_____ Date _____

I would like to ask you questions about your pregnancy, delivery, and early postpartum days, that may influence breastfeeding, and some information about your background. As you know, you and your infant are matched with another mother and infant, therefore, some questions are necessary for this match.

Please tell me:

1. The date your infant was born _____

2. Was your baby earlier or later than you expected? (weeks gestation)_____

3. How long was your labor? (hours)_____

4. What kind of delivery did you have?_____
   (1) SVD; (2) forceps; (3) emergency C/S; (4) elective C/S

5. Did you have an anaesthetic?_____ If so, kind:_____
   (1) none; (2) epidural; (3) spinal; (4) general; (5) local

6. Did you have any intrapartum problems/complications

   Explain_____

   _____

7. Is your infant a boy or girl? (1) male; (2) female _____

8. What was your infant's birthweight? _____

9. Were there any problems or concerns about your infant at birth or during the first week?

   a) at birth (explain)_____

   b) first week (explain) _____

10. Please tell me how your infant was fed in hospital? (type of infant feeding initiated) ____
(1) breast; (2) bottle; (3) mixed
Explain how breastfeeding started and has progressed since your baby was born_____

_____

11. When did you decide that you wanted to breastfeed?_____
(Before pregnancy, early, middle or late pregnancy, after delivery)

12. How long would you like to breastfeed? _____

13. At this time, how much physical help do you get from others?_____
(e.g., washing dishes, vacuuming, laundry)
(1) much more than I need; (2) more than I need, (3) as much as I need;
(4) less than I need; (5) much less than I need

14. Who gives you most of this physical help?_____
(1) husband/partner; (2) friend; (3) mother; (4) mother-in-law;
(5) other relative; (6) no-one; (7) other_____

Identify and explain type of help_____

_____

15. At this time, is there someone that provides you with emotional support?
a) Family or friends Yes____ No____

If yes identify and explain_____

_____

b) Professional? Yes____ No____
(e.g., physician, community health nurse, clinic nurse, social worker, counsellor, other)
If yes, identify and explain_____

_____

16. Do you have relatives or friends staying with you, at this time, who are not helpful or who you wish were not living with you? Explain_____

_____

17. How would you describe your life at this time?_____
(1) much too stressful; (2) fairly stressful; (3) slightly stressful;
(4) not at all stressful

18. Do you believe that your husband/partner is supportive of breastfeeding?

If yes, how does he help the most?_____

Is there anything he could do to help you more?_____

How do you think he feels about breastfeeding?_____

_____

19. Name three people who help you the most right now_____

_____

Name three people who help you most with breastfeeding_____

_____

Name three people who are least supportive of your breastfeeding_____

_____

20. Have you had any contact with a community health nurse? _____

If yes, describe _____

_____

21. Have you attended a child health clinic or mothers' group? _____

If yes, describe _____

22. When did you last see your physician? Describe_____

_____

23. Have you recently had contact with any other health professional?

Describe who and reason_____

And now some questions about you:

24. How old are you? _____years

25. How many years did you go to school? _____

Education completed:
less than high school_____
high school_____
post secondary, e,g, college, technical school, partial university_____
university degree_____
post graduate degree_____

26. Were you born in Canada?_____ If no, which country?_____

If no, how long have you lived in Canada?_____

27. What is you ethnic background?_____

28. What language do you prefer to speak? _____

29. What is your marital status?_____ (1) married; (2) stable partner relationship; (3) single; (4) separated; (5) divorced; (6) widow

30. What are your living arrangements?_____
(1) alone; (2) with husband; (3) with partner; (4) other support people

Length of cohabitation with partner/husband? _____

If others, who?_____

Any that you wish were not here?_____

31. Do you have enough privacy?_____

32. Has it been difficult for you to find affordable housing?_____

_____

33. Are you employed? Yes____ No_____ On maternity leave?_____

If no, have you had a job in the past 9 months? Yes_____ No_____

If yes, what was your job?_____

If currently working, how many hours a week do you work?_____

34. Do you intend to return to work in the near future? Yes_____ No_____

If yes, describe when, full or part time and type of work_____

_____

35. What is the main source of income in your household? _____
(1) social assistance; (2) employed (self); (3) husband or partner employed; parents or other family support; (5) unemployment insurance; (6) scholarship/grant; (7) savings; (8) other (explain)_____

36. What was the TOTAL income in your household, before taxes, last year?_____
(1) < $20,000; (2) $20,000 to 29,999; (3) $30,000 to 39,999;
(4) $40,000 to 49,999; (5) $50,0000 to 59,999; (6) $60,000 to 69,999
(7) $70,000 to 79,999; (8) $80,000 to 89,999; (9) $> $90,000

I would like to know more about your husband/partner:

37. How old is he? _____years

38. How many years did he go to school? _____

Education completed:
less than high school_____
high school_____
post secondary, e,g, college, technical school, partial university_____
university degree_____
post graduate degree_____

39. Is he working?_____ If so, what is his occupation?_____

40. Was he born in Canada?_____ If no, which country?_____

If no, how long have you lived in Canada?_____

41. What is his ethnic background? _____

42. What language does he prefer to speak? _____

If not how long has he lived in Canada?_____

43. Are there any other family concerns that may effect breastfeeding?

Explain_____

44. Do you have any other comments or concerns that you would like to describe?

Appendix E

Breastfeeding Assessment Guide and Information Notes

Mother Infant Interaction During Breastfeeding

BREASTFEEDING ASSESSMENT GUIDE

Subject Code:_____ Date:_____

Mother's perception of breastfeeding concern (if applicable):_____

_____

_____

_____

INFANT ASSESSMENT

Birthdate:_____ Present age (weeks)_____

Birth weight_____ Current weight_____

Length_____ Head circumference_____

Feedings in 24 hours: Number_____ Frequency: Day_____ Night_____

Length of feedings_____

Baby's behaviors during feeding (mother's description)_____

_____

Baby's satisfaction/behavior after feeding _____

_____

_____

Supplementation

substance _____

frequency _____

feeding method _____

daily amounts _____

other foods, vitamins _____

Diapers: Number of wet diapers per day _____

Bowel movements (frequency and consistency_____

Infant oral exam: Anatomy/appearance - describe any deviations from normal

General appearance of face, cheeks, lips, chin _____

_____

_____

Subject # _____

Tongue: thin_____ flat _____ bunched _____ humped _____ retracted _____

tip elevated _____ central groove _____ frenulum_____

other comments_____

Suck (finger) weak _____ strong _____ rhythmic _____ uncoordinated _____

Describe _____

Palate intact_____ other_____

Other comments_____

_____

MATERNAL ASSESSMENT

Significant past history that would affect breastfeeding (e.g., breast surgery, hypoplasia, thyroid condition, diabetes etc.) Describe _____

_____

Did your breasts enlarge during pregnancy?_____

Breasts - describe size, shape, symmetry, firmness

Right _____

Left _____

_____

Areola - describe size, shape, bruises if apparent

Right_____

Left_____

Nipples - describe size, symmetry, protrude, pseudoprotude, flat, pseudoinverted, inverted, elasticity, cracks, craters if apparent

Right_____

Left_____

Milk expression - describe ease, difficult, not at all_____

_____

Pain/tenderness - describe where and when_____

_____

_____

Subject # _____

Mother's description of her feelings about breastfeeding_____

_____

_____

_____

_____

BREASTFEEDING ASSESSMENT

Position - describe type and problems/concerns about position_____

_____

_____

Baby's latch - describe openness of mouth, position of lips, type of latch and changes that occur during the feeding _____

_____

_____

Suckling technique - describe types of suckling pattern (rests and types of suck) observed and observed during the feeding _____

_____

_____

Jaw movement during suckling _____

_____

Swallow - describe audibility and frequency_____

_____

Respirations during feeding - smooth_____ coordinated_____ regular_____ periods of apnea_____ other_____

Additional comments re feeding function - describe any clicking, indrawing of cheeks, etc.

_____

Infant state during feeding _____

_____

Infant's interest in breastfeeding_____

_____

4

Subject # _____

Observed baby behaviors during breastfeeding_____

_____

_____

_____

Observed maternal behaviors during breastfeeding_____

_____

_____

_____

Additional comments _____

_____

_____

_____

_____

Mother-Infant Interaction During Breastfeeding

FIELD NOTES AND FEEDING INFORMATION FORM

Subject Code _____ Date:___/____/___ Feeding time: _____

Infant's age _____ Observation #_____

Questions for mothers:

1. Would you say this is a typical feeding? Yes/No If no, Why not?_____

   _____

   _____

2. Were you uncomfortable during any part of the feeding due to my presence?
   Yes/No, If yes, why? _____

   _____

3. Do you have any concerns about the feeding or your child's eating?
   Yes/No, If yes, specify _____

   _____

4. What are your feelings about your breastfeeding experience?_____

   _____

   _____

5. For mothers with a problematic breastfeeder - Please describe your thoughts and feelings when your baby is having some difficulty feeding_____

   _____

   _____

   _____

   Please describe what you think may be causing the problem e.g. Mother? Infant?

   _____

   _____

   _____

   _____

6. Additional comments about breastfeeding:_____

   _____

   _____

   _____

   _____

2

FEEDING OBSERVATIONS: Describe the following.

INFANT STATE:

INFANT LATCH:

INFANT SUCK:

FEEDING POSITION:

INFANT BEHAVIORS:

MOTHER BEHAVIORS:

OTHER: Additional impressions about the feeding and the interaction

Appendix F

Mothers' Notation Forms: Professional and Family and Friends

MOTHER'S NOTATIONS ABOUT HEALTH PROFESSIONAL CONTACTS

Subject code_____

Instructions: For any contact that you have with a nurse, nutritionist, doctor, about breastfeeding, please record the following:

1. Date

2. Kind of professional, e.g., nurse, nutritionist, doctor, lactation consultant

3. Type of contact - telephone or visit

4. Place of contact - clinic, doctor's office, child health centre, home visit

5. Describe the breastfeedng concern

6. Describe the suggestion(s) that you were told to do for the breastfeeding concern. Did the suggestion(s) help? If there was more than one suggestion, what did you find helped you the most?

7. Any additional information thAT you found helpful, or not helpful?

If additional copies are needed, please contact Roberta Hewat at 926-3548 or 822-7464

Subject code _____

CONTACT 1: (1) Date_____ (2) Relationship of the contact_____

(3) Type of contact_____ (4) Place of contact_____

(5) Breastfeeding concern_____

(6) Suggestion(s) and what was most or least helpful_____

_____

_____

_____

(7) Additional information_____

_____

_____

_____

_____

CONTACT 2: (1) Date_____ (2) Relationship of the contact _____

(3) Type of contact_____ (4) Place of contact_____

(5) Breastfeeding concern_____

(6) Suggestion(s) and what was most or least helpful_____

_____

_____

_____

(7) Additional information_____

_____

Continued

MOTHER'S NOTATIONS ABOUT HEALTH PROFESSIONAL CONTACTS

Subject code_____

Instructions: For <u>any</u> contact that you have with a nurse, nutritionist, doctor, about <u>breastfeeding</u>, please record the following:

1. Date
2. Kind of professional, e.g., nurse, nutritionist, doctor, lactation consultant
3. Type of contact - telephone or visit
4. Place of contact - clinic, doctor's office, child health centre, home visit
5. Describe the breastfeedng concern
6. Describe the suggestion(s) that you were told to do for the breastfeeding concern. Did the suggestion(s) help? If there was more than one suggestion, what did you find helped you the most?
7. Any additional information thAT you found helpful, or not helpful?

If additional copies are needed, please contact Roberta Hewat at 926-3548 or 822-7464

Subject code _____

CONTACT 1: (1) Date_____ (2) Type of professional_____

(3) Type of contact_____ (4) Place of contact_____

(5) Breastfeeding concern_____

(6) Suggestion(s) and what was most or least helpful_____

_____

_____

_____

(7) Additional information_____

_____

_____

_____

CONTACT 2: (1) Date_____ (2) Type of professional_____

(3) Type of contact_____ (4) Place of contact_____

(5) Breastfeeding concern_____

(6) Suggestion(s) and what was most or least helpful_____

_____

_____

_____

(7) Additional information_____

_____

_____

Continued

Appendix G

Informed Consent Form and Explanation of the Study

THE UNIVERSITY OF BRITISH COLUMBIA

School of Nursing
T. 206-2211 Wesbrook Mall
Vancouver, B.C. Canada V6T 2B5
Fax: (604) 822-7466

INFORMATION SHEET FOR PARTICIPANTS

PROJECT TITLE: Mother-Infant Interaction During Breastfeeding: A Comparison Between Problematic and Nonproblematic Breastfeeders

INVESTIGATOR: Roberta Hewat, RN, MSN, IBCLC

Doctoral Candidate (Nursing)
Faculty of Nursing, CSB, 3rd floor
University of Alberta
Edmonton, AB, T6G 2G3
TEL: (403) 492-6836
FAX: (403) 492-2551

OR

School of Nursing
T206, 2211 Wesbrook Mall
University of British Columbia
Vancouver, BC, V6T 2B5
TEL: (604) 822-7464
FAX: (604) 822-7466

SUPERVISOR: Project Supervisor, Edmonton
Dr. P.A. Field, RN, PhD
Professor
Faculty of Nursing, CSB, 3rd floor
University of Alberta
Edmonton, AB, T6G 2G3
TEL: (403) 492-6248
FAX: (403) 492-2551

Advisor to contact in Vancouver
Dr. J. Bottorff, RN, PhD
Associate Professor
School of Nursing
University of British Columbia
Vancouver, BC, V6T 2B5
TEL: (604) 822-7438
FAX: (604) 822-7466

Description of the Project

PURPOSE: The purpose of this study is to learn more about how mothers and infants interact during breastfeeding. Infants who frequently detach from the breast and who may choke, cough, gag, or cry frequently during breastfeeding will be studied. These mothers and infants will be compared to mothers and infants that are breastfeeding well.

PROCEDURE: Breastfeeding sessions will be videotaped three times by the investigator. The first taping will be done as soon as possible and the second taping will done within 36 hours of the first. The third taping will be done when your infant is six weeks old. Each videotaping will take place in your home at a time that is convenient for you. Only the investigator will be

present to videotape the breastfeeding sessions. The camera will be placed on a tripod approximately six to eight feet from your feeding chair. A microphone on a stand will be placed near your chair. During the first visit the investigator, a lactation consultant and nurse, will do a breastfeeding assessment on you and your infant. This includes physically examining your infant and your breasts. Questions will also be asked about how you find breastfeeding and about the support you receive. Between the visits you will be asked to keep notes on any breastfeeding advice that you receive from professionals, family, or friends. At the final visit you will be asked to complete two questionnaires. They will take approximately 35 minutes of your time. Depending on how long your infant feeds, each videotaping could take about one hour. The total time that you may spend on the project is four to five hours.

RISKS and BENEFITS: There will be no harm to you or your baby if you participate. However, there may be some loss of privacy through the observations and videotapes. You will not benefit directly from this study. But study findings may help nurses or other health professionals to develop more effective ways of helping mothers and infants that have difficulty breastfeeding. If you wish, a free videotape of your breastfeeding sessions will be given to you at the end of the study.

CONFIDENTIALITY: Your name will not appear in this study. Only a code number will be used on any forms, question sheets, or videotapes. If your name is audible on the videotape, it will be erased. During the project only the investigator, her supervisor, and assistants will view the videotapes. All tapes, forms, and questionnaires will be stored in a locked cabinet in the investigator's office. The signed consent forms will be kept for five years and stored in a locked drawer separate from the study data. The videotapes may be used for another study in the future. This will be done only if approval is received from an appropriate ethical review committee.

The information and findings of this study may be published or presented at a conference. Your name or any material that may identify you will not be used. If a picture from a videotape is used your face will be shaded. Or, you may sign a form consenting use of pictures or videotape segments without shaded faces for educational or conference presentations or publications. Confidentiality of your name and the information that you provide is assured.

STUDY PARTICIPATION: You do not have to be in this study if you do not wish to be. If you decide to be in the study, you may drop out at any time by telling the investigator. You do not have to answer any questions if you do not want to. Taking part in this study or dropping out will not affect your health care. You will receive the same services at clinics and from doctors and nurses in the community.

If you have any questions about this study, at any time, please contact the investigator, Roberta Hewat at (604) 822-7464 (office) or (604) 926-3548 (home).

If you choose to participate in this study, a **Consent Form** is attached for you to sign.

THE UNIVERSITY OF BRITISH COLUMBIA

School of Nursing
T. 206-2211 Wesbrook Mall
Vancouver, B.C. Canada V6T 2B5
Fax: (604) 822-7466

CONSENT FORM

PROJECT TITLE: Mother-Infant Interaction During Breastfeeding: A Comparison Between Problematic and Nonproblematic Breastfeeders

PURPOSE: The purpose of this study is to learn more about how mothers and infants interact during breastfeeding. Infants who frequently detach from the breast and who may choke, cough, gag, or cry frequently during breastfeeding will be studied. These mothers and infants will be compared to mothers and infants that are breastfeeding well.

INVESTIGATOR: Roberta Hewat, RN, MSN, IBCLC

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videotaping will take place in your home at a time that is convenient for you. Only the investigator will be present to videotape the breastfeeding session. The camera will be placed on a tripod approximately six to eight feet from your feeding chair. A microphone on a stand will be placed near your chair. During the visits the investigator, a lactation consultant and nurse, will do a breastfeeding assessment on you and your infant. This includes physically examining your infant and your breasts. Questions will also be asked about how you find breastfeeding and the support you receive. Between the visits you will be asked to keep notes on any breastfeeding advice that you receive from professionals, family, or friends. At the final visit you will be asked to complete two questionnaires. They will take approximately 35 minutes of your time. Depending on how long your infant feeds, each videotaping could take about one hour. The total time that you may spend on the project is four to five hours.

PARTICIPATION: There will be no harm to you or your baby if you participate in this study. However, there may be some loss of privacy through the observations and videotapes. You will not benefit directly from this study. The study results will help health professionals to develop more effective ways of helping mothers and infants that have difficulty breastfeeding. This will help to improve the care that health professionals provide. If you wish, a free videotape of your breastfeeding sessions will be given to you at the end of the study.

You do not have to be in this study if you do not wish to be. If you decide to be in the study, you may drop out at any time by telling the investigator. You do not have to answer any questions if you do not want to. Taking part in this study or dropping out will not affect your health care. You will receive the same services at clinics or from doctors and nurses in the community.

Your name will not appear in this study. Only a code number will be used on any forms, question sheets, or videotapes. Your name will be erased from the videotape if it is audible. During the project only the investigator, her supervisor, and assistants will view the videotapes. All records will be stored in a locked cabinet. The signed consent forms will be kept for five years in a locked drawer. The videotapes may be used for another study in the future. This will only be done if approval is received from an appropriate ethical review committee.

The information and findings of this study may be published or presented at conferences. Your name or any material that may identify you will not be used. If a picture from a videotape is used your face will be shaded unless you sign the additional consent form that is attached. Your questions about this study will be answered at any time by telephoning the investigator at the number above.

CONSENT: I acknowledge that the above research procedures have been described. Any questions have been answered to my satisfaction. I know that I may contact the investigator, her supervisor, or advisor if I have questions either now or in the future (numbers above). I have been informed of the alternatives to participating in this study. I understand the possible benefits and risks of joining the study. I have been assured that records relating to this study will be kept confidential. I understand that I am free to withdraw from the study at any time. I understand that not participating in the study or withdrawing at any time will not affect my health care. I understand that if any information from the study becomes available that could influence my decision to continue in this study, I will be promptly informed. I have been given a copy of this form to keep.

_____ _____

(Signature of Participant) (Date)

_____ _____

(Signature of Investigator) (Date)

_____

If you wish to receive a summary of the study when it is finished, please complete the following:

Name: _____ Address: _____

_____

If you wish a free copy of your feeding video, please check _____

USE OF VIDEOTAPE CONSENT FORM

PROJECT TITLE: Mother-Infant Interaction During Breastfeeding: A Comparison Between Problematic and Nonproblematic Breastfeeders

INVESTIGATOR: Roberta Hewat, RN, MSN, IBCLC

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School of Nursing
University of British Columbia
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TEL: (604) 822-7438
FAX: (604) 822-7466

CONSENT: I permit pictures or segments of videotapes, without shaded faces, to be used for professional presentations or publications. I have been given a copy of this form to keep.

_____ _____
(Signature of Participant) (Date)

_____ _____
(Signature of Investigator) (Date)

Appendix H

Behavioral Analysis: Major Behavioral Codes and Interactions

Behavioral Analysis: Major Behavioral Categories and Interaction Patterns

Major Group		Code	Problem Grp. % of Total Time	Nonproblem Grp. % of Total Time	Statistical Significance
100 Mother Looks	Unable to deter.	1	1	0	ns
	Towards face	2	92	88	
	Towards body	3	2	2	
	Towards another	4	5	10	
200 Mother Touch	No touch	1	49	21	p < 0.001
	Non-moving	2	26	53	
	Gentle	3	5	16	
	Firm	4	10	2	
	Rubbing	5	1	2	
	Caretaker	6	9	5	
300 Mother Posture	Relaxed	2	8	42	p < 0.001
	Relaxed but rigid	3	42	46	
	Tense	4	50	12	
400 Mother Affect	Positive	2	35	90	p < 0.001
	Neutral	3	19	2	
	Sad	5	47	9	
600 Infant Looks	End of episode	1	1	0	ns
	Looking at mother	2	91	97	
	Not looking at mother	3	9	3	
700 Infant Touch	No touch	1	43	46	p = 0.005
	Non-moving	2	31	43	
	Gentle	3	5	6	
	Firm	4	12	3	
	Random	5	10	1	
800 Infant Posture	Relaxed	2,3	30	90	p < 0.001
	Tense	4	70	10	
900 Infant Movement	No activity	1	51	69	p < 0.001
	Slight hand/limb	2,3	22	24	
	"Jerky" / Agitated	4,5	28	7	
1100 Enface Position	End of episode	1	1	0	ns
	Enface	2	1	4	
	Not enface	3	98	96	
1200 Feeding	Positioning	2	3	1	p = 0.002
	At Breast	3,4	74	92	
	Off breast	5	22	6	
Mother-Infant Interaction Revised	Harmonic Attunement		18	73	p < 0.001
	Disharmonic Attunement		49	7	
	No Attunement		33	20	

Mother-Infant Interaction excluding Females

Mother-Infant Interaction Revised	Harmonic Attunement	20	75	p < 0.001
	Disharmonic Attunement	44	6	
	No Attunement	36	19	

Average Seconds Per Session (minimum, maximum)	977 (368, 1896)	1090 (356, 2020)

Appendix I

Figures Illustrating Behavioral Codes

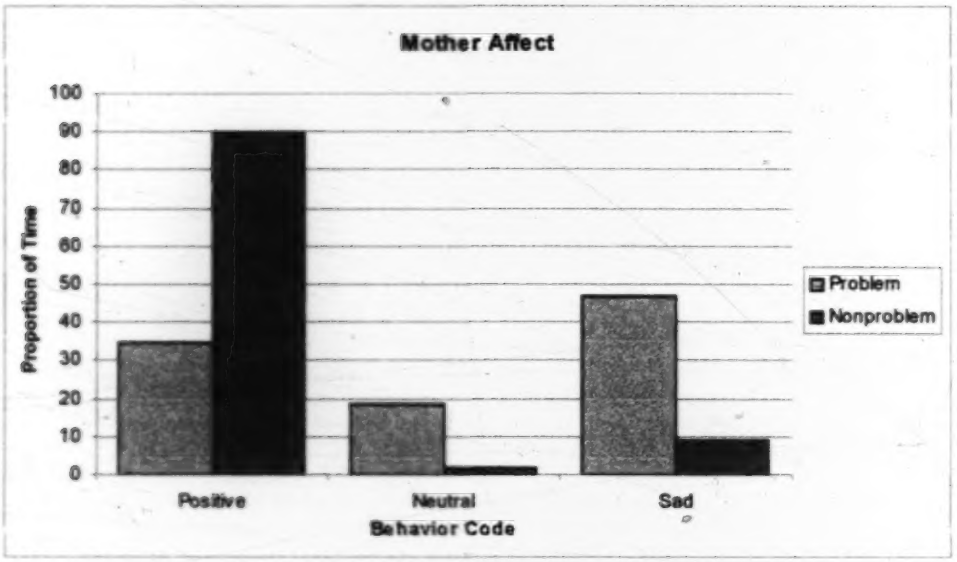

Figure 8. Comparison of duration proportions of mother affect during breastfeeding between problematic and nonproblematic breastfeeding groups.

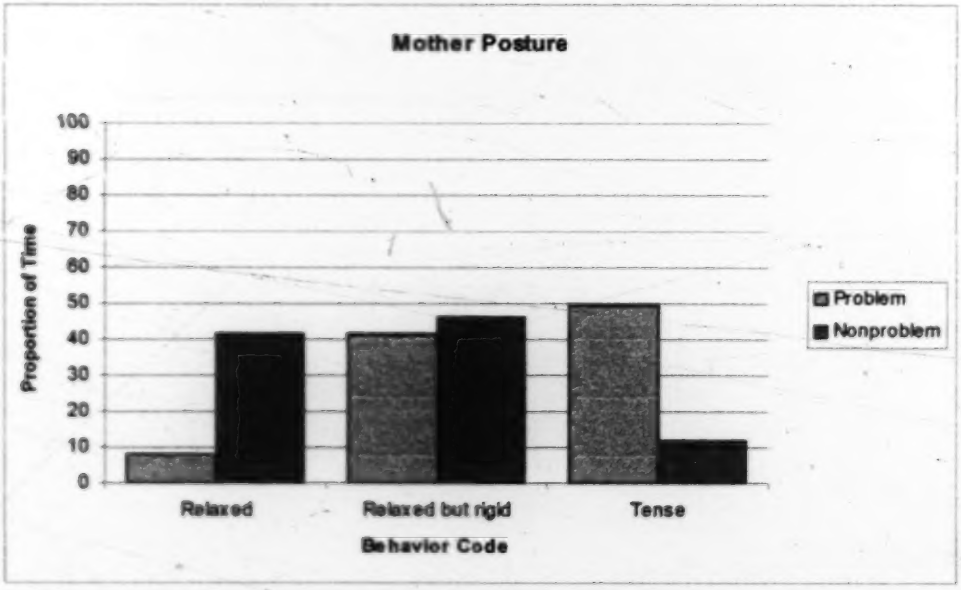

Figure 9. Comparison of duration proportions of mother posture during breastfeeding between problematic and nonproblematic breastfeeding groups.

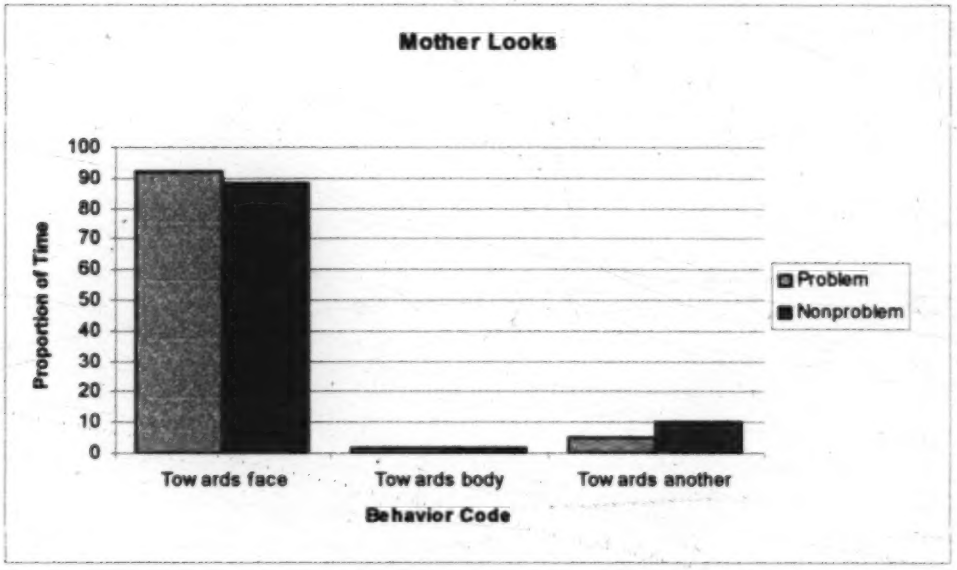

Figure 10. Comparison of duration proportions during breastfeeding of mother look between problematic and nonproblematic breastfeeding groups.

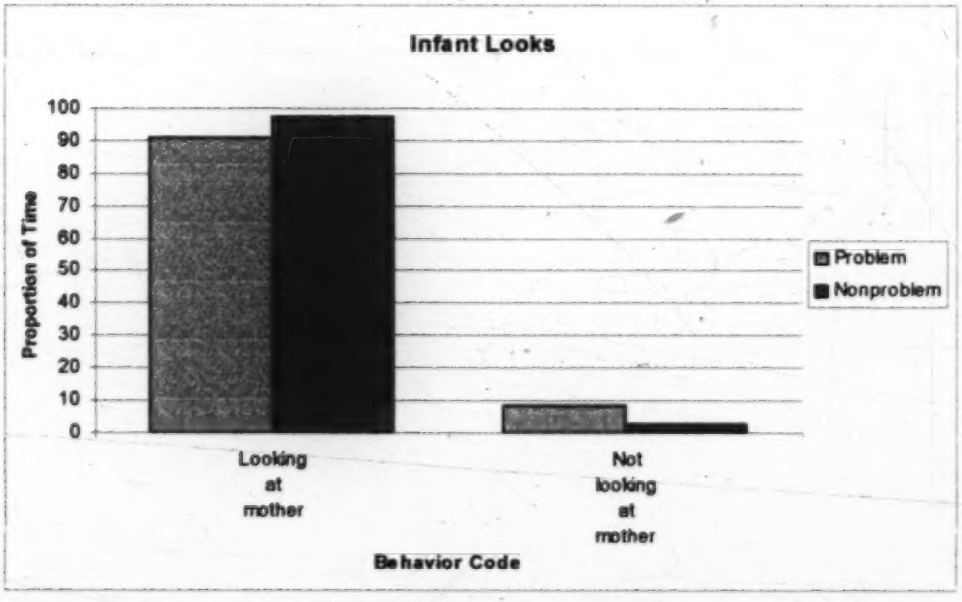

Figure 11. Comparison of duration proportions during breastfeeding of infant look between problematic and nonproblematic breastfeeding groups.

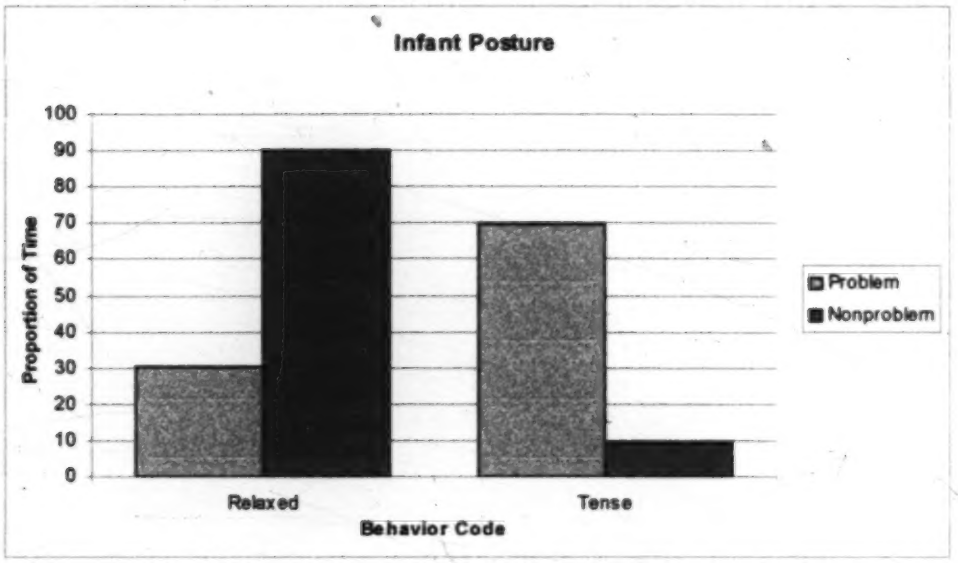

Figure 12. Comparison of duration proportions during breastfeeding of infant posture between problematic and nonproblematic breastfeeding groups.

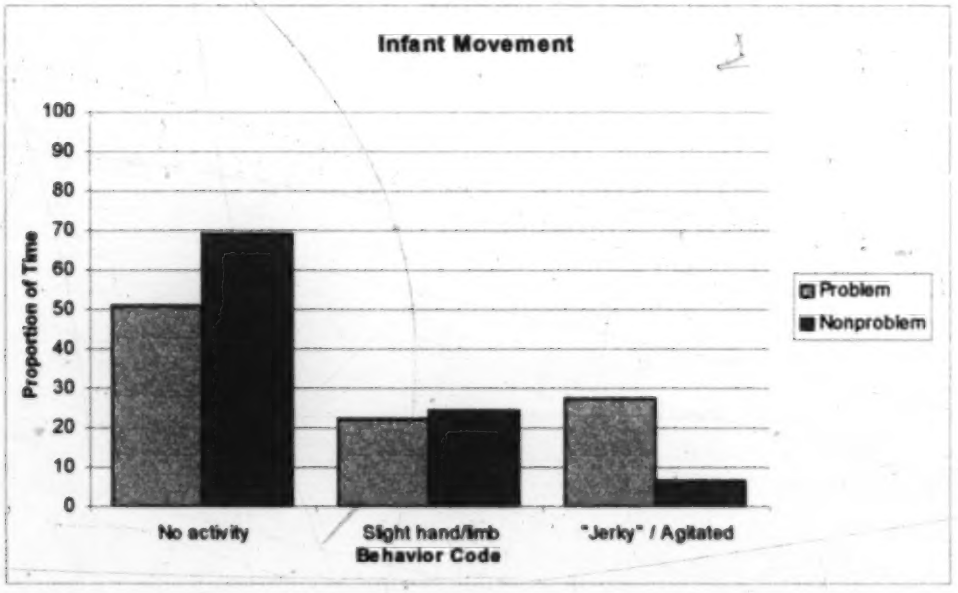

Figure 13. Comparison of duration proportions during breastfeeding of infant movement between problematic and nonproblematic breastfeeding groups.